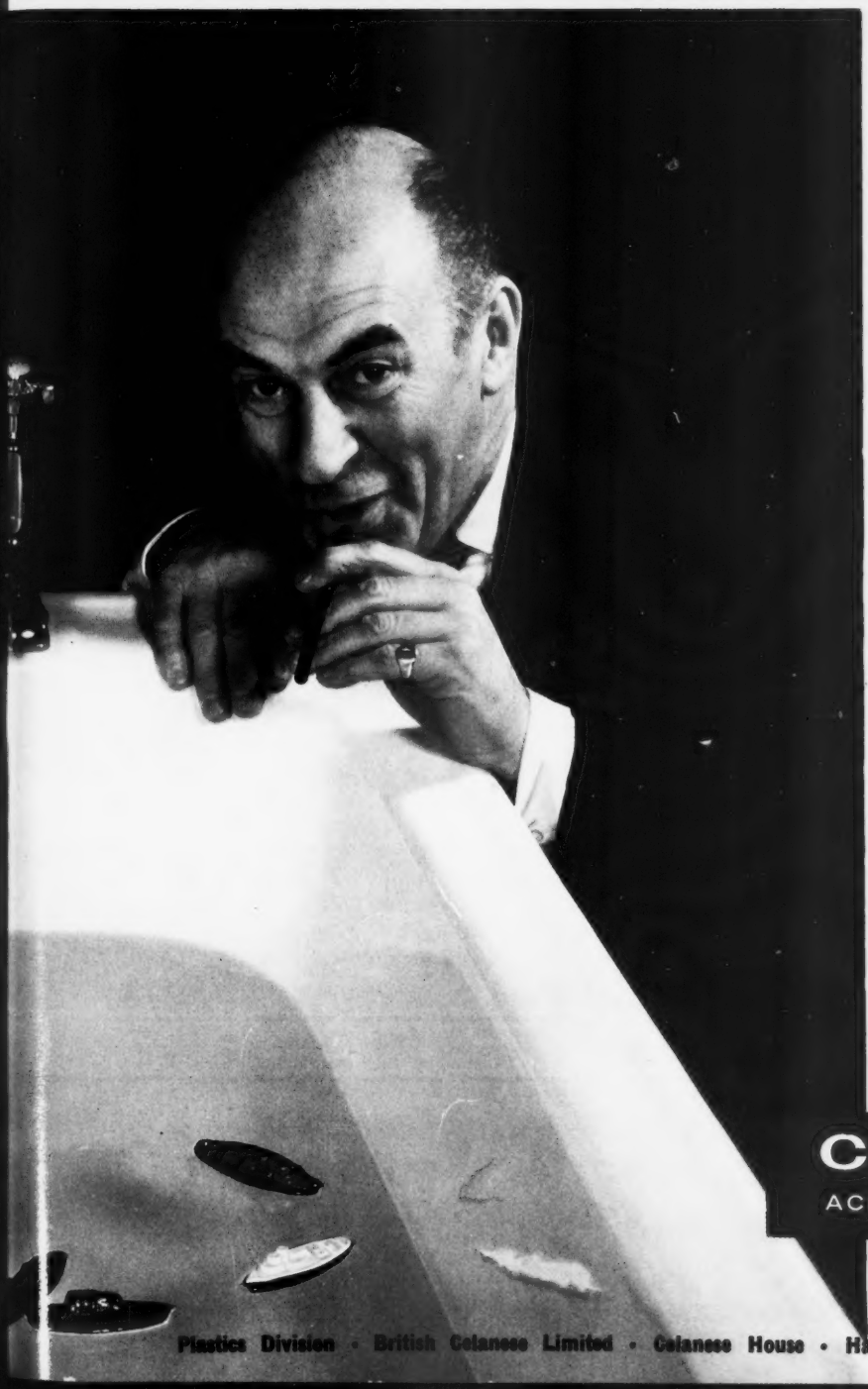
TECHNOLOGY DEPT.

Plastics

DEALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS



Ship-shape, 'Mr. Chad'?

Ship-shapes, or any other shapes, are produced with speed and economy in vacuum-formed Cellastine. That's why Chad Valley choose Cellastine for something really original in bath toys—colourful blow-boats—demonstrated here by Kenneth Horne, Chairman of Chad Valley. Quality finish, unique detail-reproduction and brilliant colours are properties that keep Cellastine consistently in demand for a variety of toys.

Photographed in the showroom of John Bolding & Sons, Ltd.

Cellastine TRADE MARK
ACETATE SHEETING

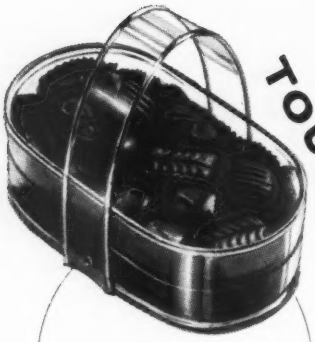
Plastics Division • British Celanese Limited • Celanese House • Hanover Square • London • W.1

Bexoid

Regd

Cellulose Acetate

TOUGH · BRILLIANT · COLOURFUL



FILM
transparent boxes
displays
packs
showcard coverings
cartoon films

SHEET
spectacle frames
lampshades
toys
printers' cutting plates
displays

MOULDING POWDER
industrial mouldings
brush handles
toys

Profit from Experience

BX Plastics are the leading manufacturers of cellulose acetate, with unrivalled experience of all three forms—

SHEET
MOULDING POWDER
FILM

Leading Moulders order from BX with complete confidence.

Write for Technical Data Sheets.

BX PLASTICS LTD. *A subsidiary of The British Xylonite Co. Ltd.*

Higham Station Ave, London E.4. *Telephone: Larkswood 5511*

When Geigy was founded..... 1758

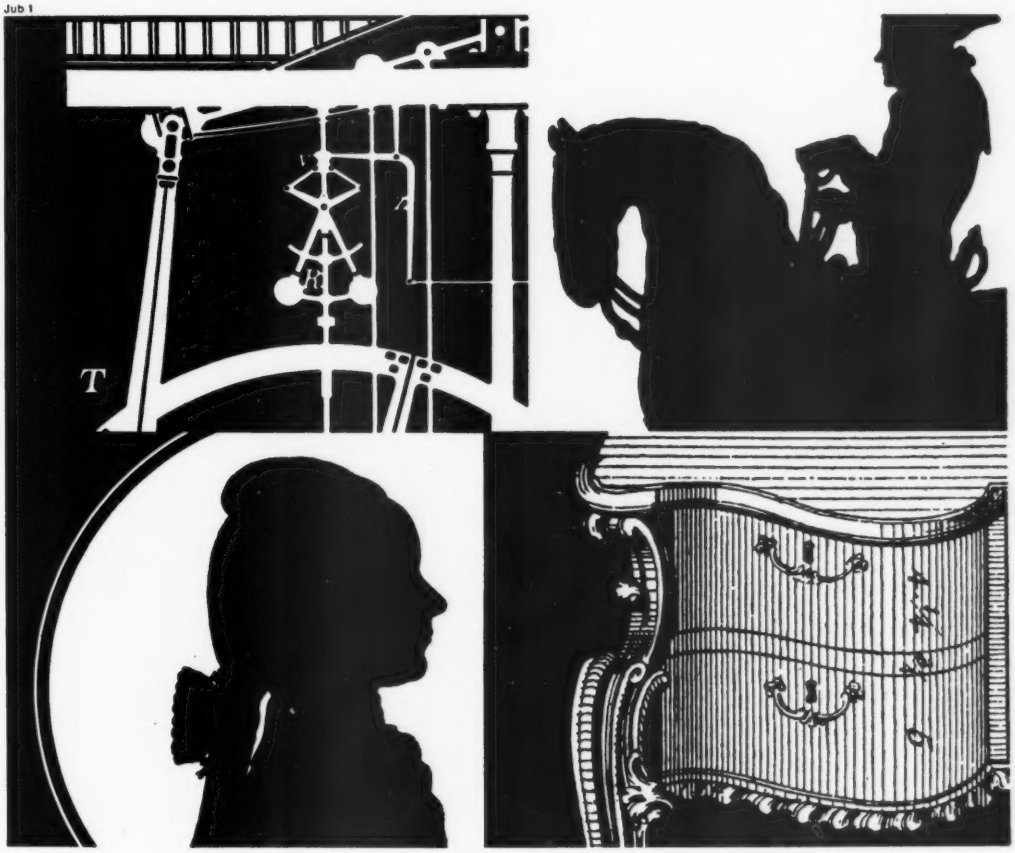
Rococo was in fashion. Madame Pompadour was the ruling favourite at Versailles. Haydn was composing music, Voltaire and Rousseau were writing, Goethe and Mozart were still in their childhood. A few years earlier, Benjamin Franklin had invented the lightning conductor; a few years later James Watt built the first steam engine. In France, Diderot and d'Alembert were working on their Encyclopaedia; the University of San Felipe in Santiago de Chile was two years old, the Vienna and Edinburgh Stock Exchanges five. Adam Smith was writing the Wealth of Nations. Britain and France were fighting for possession of overseas territories, and war was also in progress between Frederick the Great and Maria Theresa, Empress of Austria. Porcelain factories were being founded, cement had just been discovered; and the cabinet-maker Chippendale had created a new style of furniture.

In 1758 one of the oldest chemical firms in the world was founded in Basle, Switzerland. It was a shop where dyes, drugs and chemicals were sold, and the founder's name was Johann Rudolf Geigy.

The firm has carried that name ever since. This year J. R. Geigy S.A., of Basle, joins its associates throughout the world to celebrate the 200th year of its foundation. In two centuries the one-man business has grown into an international concern whose products — like the DDT insecticides and the Mitin mothproofing process — are famous everywhere.

The Geigy Group of Companies today make and sell dyestuffs, pigments and tanning materials, industrial chemicals, plasticisers, pesticides and pharmaceuticals. In the field of organic chemicals the name of Geigy is a mark of quality.

Jub 1



200 years Geigy

Bi.I.

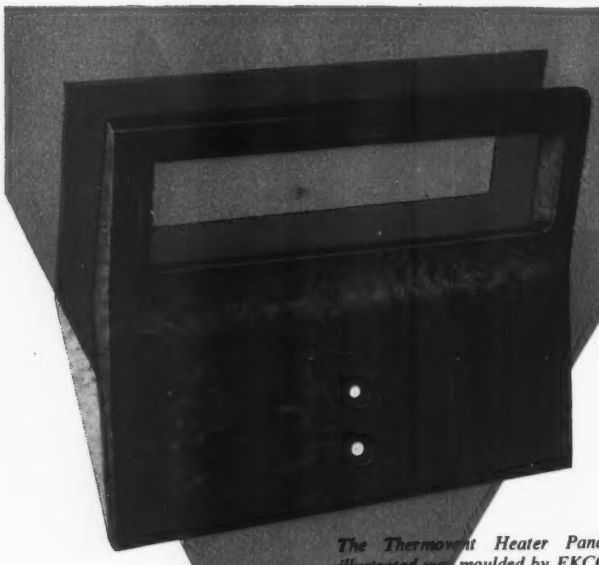
A

* Leading Moulders use

STERNITE

MOULDING POWDER

The Belvedere Toilet Assembly illustrated was moulded by EKCO PLASTICS LTD. in Sternite general purpose grade SPF. 34/3.



The Thermovent Heater Panel illustrated was moulded by EKCO PLASTICS LTD. in Sternite cabinet grade SPF. 41.

The comprehensive range of Sternite phenolic moulding materials includes a wide variety of general purpose and special purpose types including Telephone Grade 1, H.D., Low Loss, Medium Shock, Water, Heat, Acid and Alkali resistant grades, conforming to BSS.771, M.o.S., A.I.D., Post Office and Admiralty requirements.

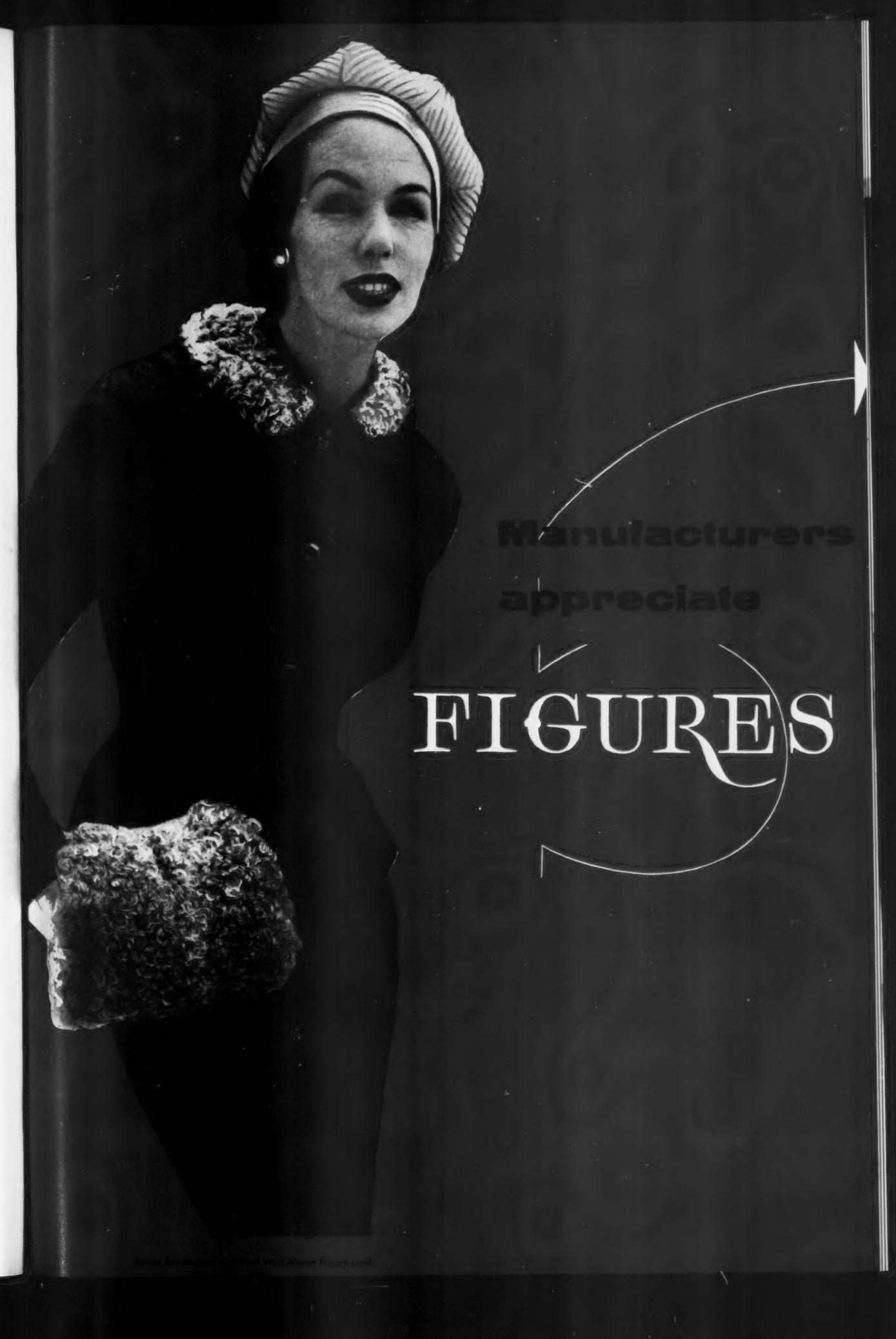
Sterling Moulding Materials Ltd.

STERLING HOUSE, HEDDON STREET, LONDON, W.1.

Member THE BRITISH PLASTICS FEDERATION

S.19

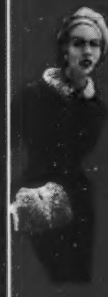
Works: Stalybridge, Cheshire. Phone: Regent 8641-50. Grams: Stermold, Piccy, London. Cables: Stermold, London.


Manufacturers
appreciate
FIGURES

The FACTS are in the FIGURES

Specification Model 25

Approximate Extrusion Capacity* Polyethylene	
Standard Screw Length/ Diameter*	
Heating	
Cooling	Barrel: 3 zones Manual or Auto Control Hopper Section Screw
Reduction Gear	Worm
Drive	H.P.
Floor Space	Extruder Control Cabinet
Weight (English Tons) (U.S. Tons)	Extruder. Cabinet Extruder. Cabinet



Specification Model 45

Approximate Extrusion Capacity* Polyethylene	
Standard Screw Length/ Diameter*	
Heating	Barrel: 3 zones, total Kw. Die-head: 2 zones
Cooling	Barrel: 3 zones Manual or Auto Control Hopper Section Screw
Reduction Gear	Worm
Drive	H.P.
Floor Space	Extruder Control Cabinet
Weight (Approx.)* (English Tons) (U.S. Tons)	Extruder. Cabinet Extruder. Cabinet

* Nominal output figures. These are dependent upon the type of die, take-off system, skill of operator, etc.

The quality of the materials, the precision of the engineering, the design of the heating, cooling and lubrication systems, and the exceptional ease of control and maintenance, all reflect PECO's close study and understanding of the manufacturer's requirements.

A Division of the PECO organisation is exclusively concerned with research and development in the field of plastics. PECO's After-Sales Service has an excellent reputation: as you would expect — first-class engineers provide a first-class service.

PECO PRODUCTS

PECO

PECO MACHINERY SALES (Westminster) LTD.

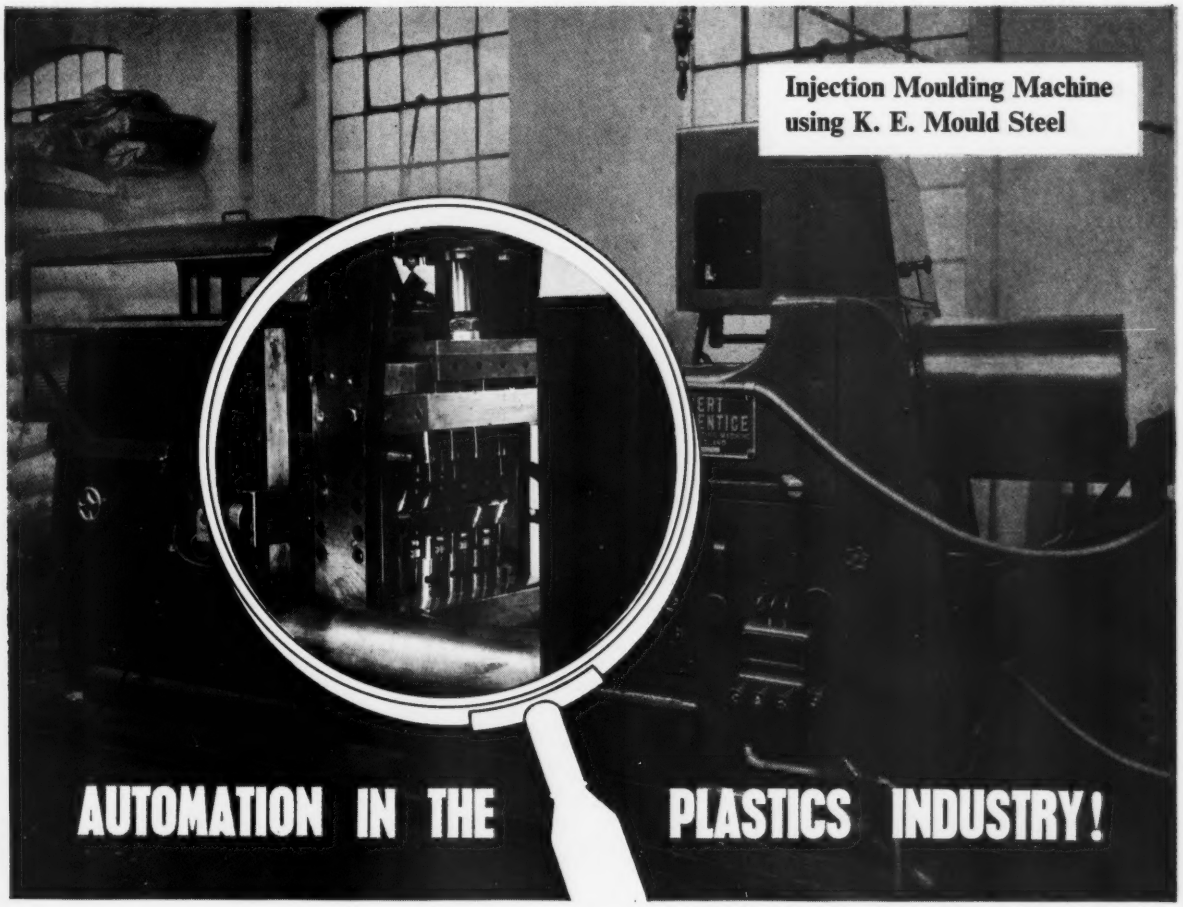


Illustration by courtesy of Wolseley Engineering Ltd.

REPEAT ORDERS ARE USUALLY AUTOMATIC ONCE (K)(E) HIGH GRADE MOULD STEELS HAVE BEEN USED

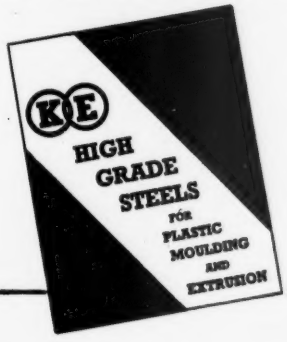
(K)(E) 355 Special Nickel Chrome Molybdenum Oil or Air Hardening Mould Steel.

(K)(E) 961 1½% Carbon 12% Chrome High Duty Mould Steel.

(K)(E) A28 Special Stainless Mould Steel.

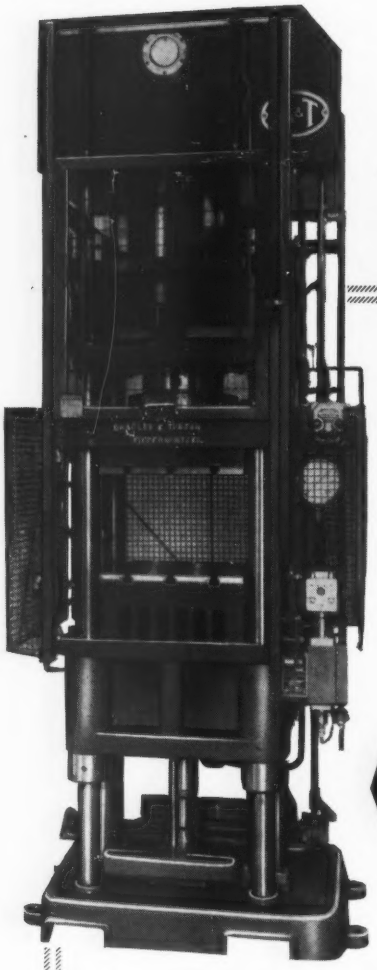
Melted to close limits of analysis. Forged with an adequate reduction of area from the ingot to ensure the maximum amount of grain distortion. Carefully annealed to give optimum machinability and grain refinement. Ultrasonically inspected prior to despatch. These factors and almost one and a half centuries of steel-making experience give our Steels a high degree of regularity and reliability. These Steels have great strength and do not distort under the high pressure of injection moulding.

This booklet, giving greater detail, is available free on request.



KAYSER ELLISON & CO. LTD

CARLISLE STEEL WORKS · SHEFFIELD · ESTABLISHED 1825

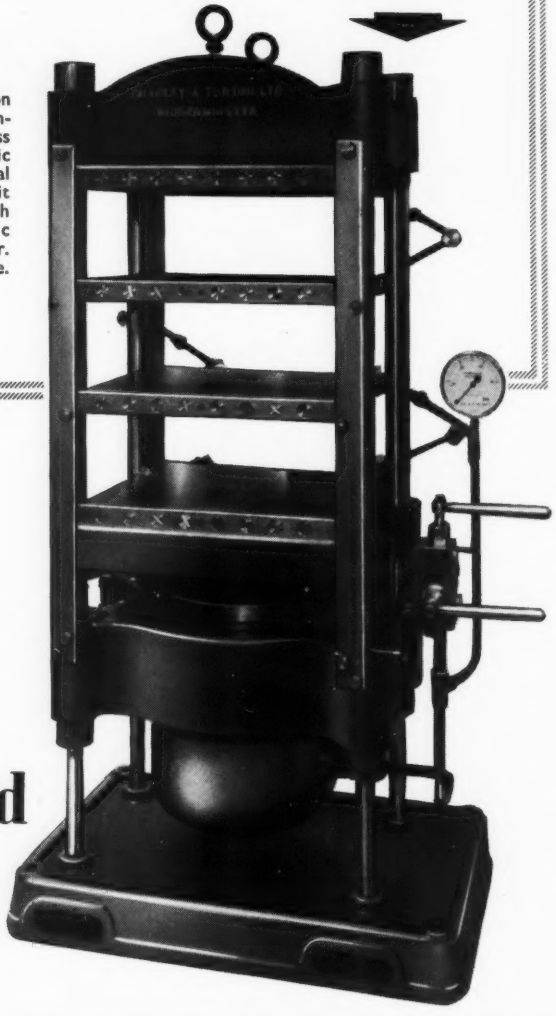


B&T

RUBBER AND PLASTICS MOULDING EQUIPMENT

No. 202R. 50-ton Upstroking Moulding Press with four 24-in. square Steam Heated Platens. Suitable for accumulator or direct pump system.

No. 936. 150-ton Self-Contained Down-stroking Moulding Press with semi - automatic ejector gear and integral motor driven pump unit and fitted with push button Automatic Process Controller. Platens 20 ins. square.



Presses: Upstroking, Downstroking, Side Ram and Multidaylight.

Pumps: Variable and fixed delivery.

Accumulators: Gas and ballast loaded.

Process Controllers: Push button operated.

Pelleting Presses, etc.

Bradley & Turton Ltd

CALDWALL WORKS, KIDDERMINSTER

Telephone: 2217-8

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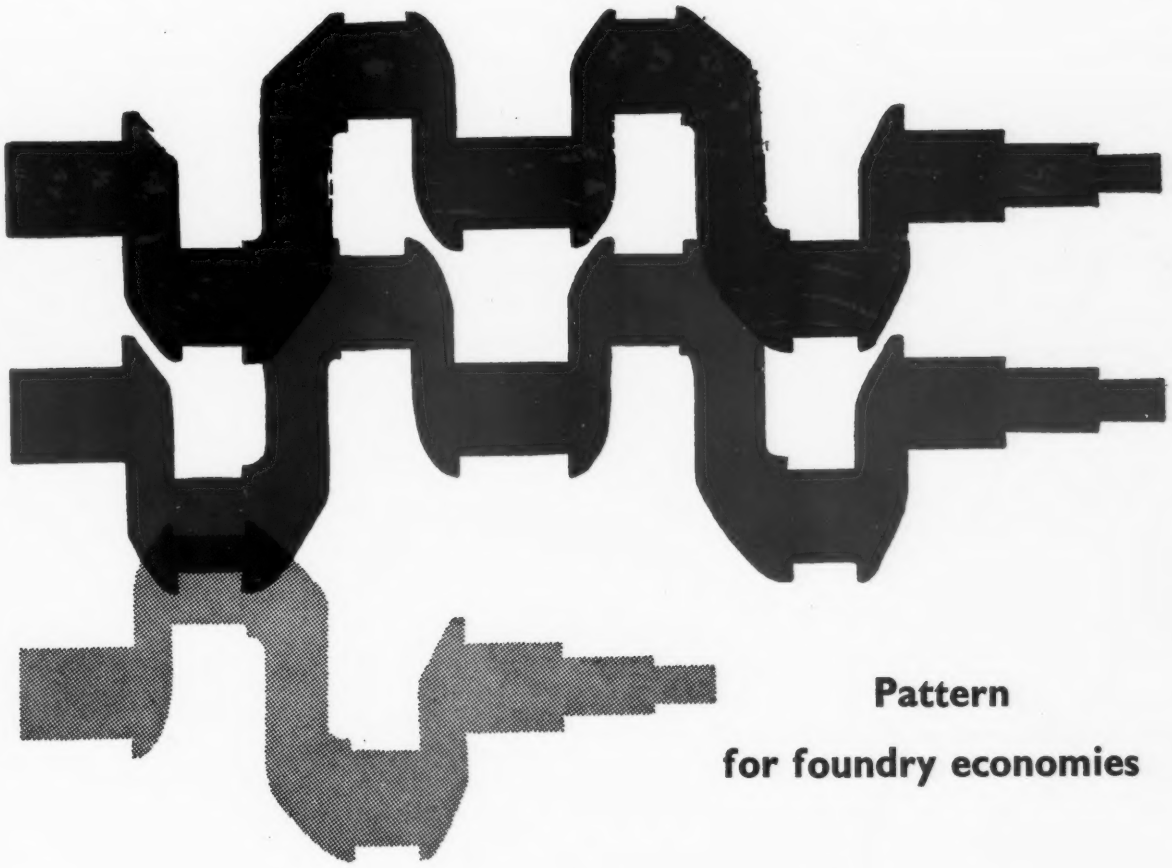
THE LEADING MANUFACTURERS OF COMPRESSION MOULDING EQUIPMENT



Pattern for foundry economies

"Epikote" resin foundry patterns are quickly made, accurate and durable. Cast by simple techniques at room temperatures, "Epikote" resin patterns, because of their very low shrinkage on cure, reproduce the master exactly in detail and finish, and are the complete answer to duplication problems.
Compared with wood, "Epikote" resins are warp free, unaffected by moisture and temperature extremes, more resistant to accidental damage, and never need polishing or painting.
Compared with metal they are far cheaper, completely resistant to corrosion by moisture and most chemicals, easy to repair and offer weight savings of up to 80 per cent.
Ask for details of these important developments.

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SHELL CHEMICAL COMPANY LIMITED
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E.E.1 "EPIKOTE" *is a Registered Trade Mark*

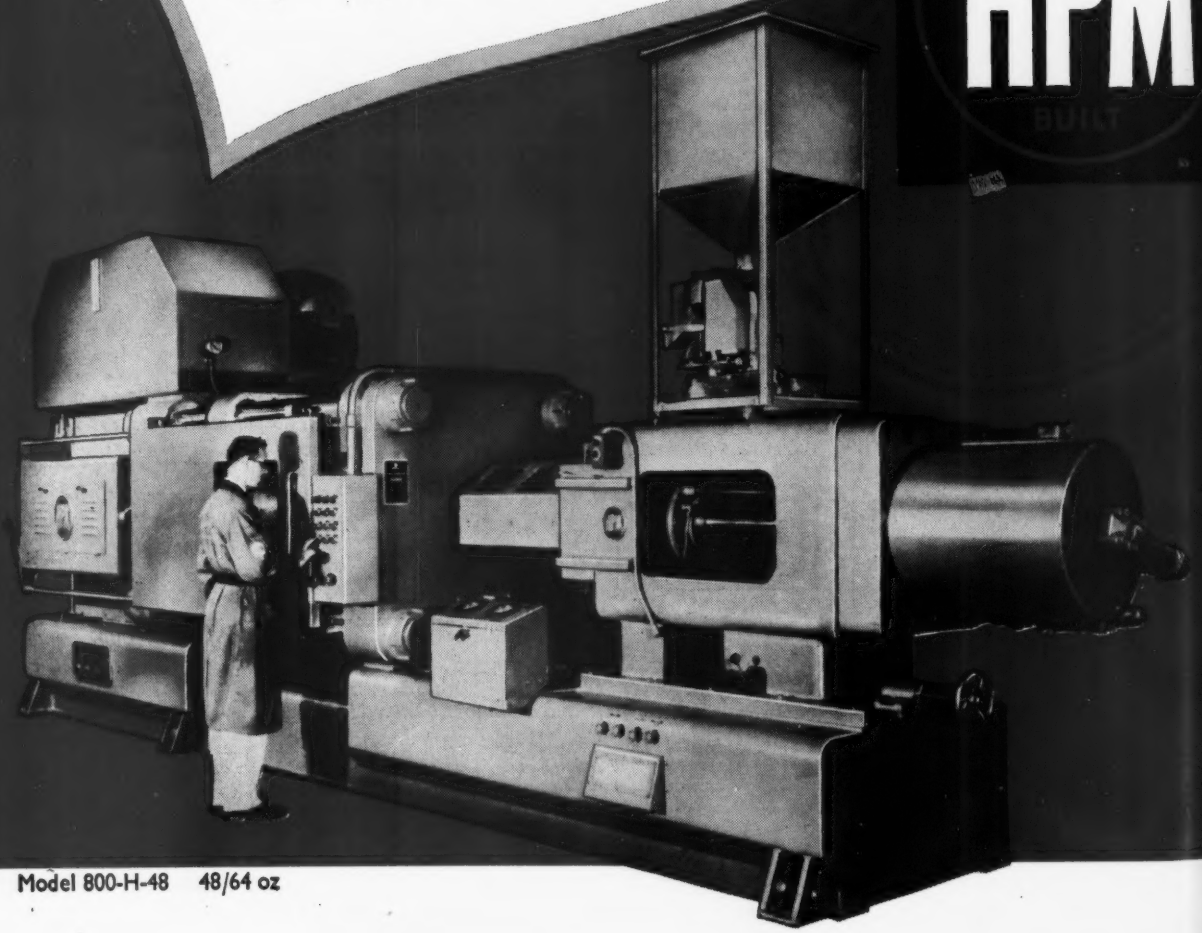
Dependable moulding at

- Rapid action H.P.M. straight-line hydraulic mould clamp, quick interchange of moulds with automatic adjustment for thickness.
- Full ejecting pressure secured at any point of the return stroke. Increased daylight and stroke for producing deep parts.
- High speed injection unit increases plasticizing rate, and fast injection plunger speed reduces cycle times.
- Accurate compensating weigh feeders, and an extra timer permit double feeding of material for large capacity shots.
- Dual injection pump for two-speed injection or dual pressure injection, as desired.
- Silent pumps supply hydraulic power for maximum clamping pressure and operation of clamp and injection rams.
- All hydraulic components are readily accessible. A minimum of pipe lines permits easy interchange of valves without interference.

BRITISH

HPM

BUILT



Model 800-H-48 48/64 oz

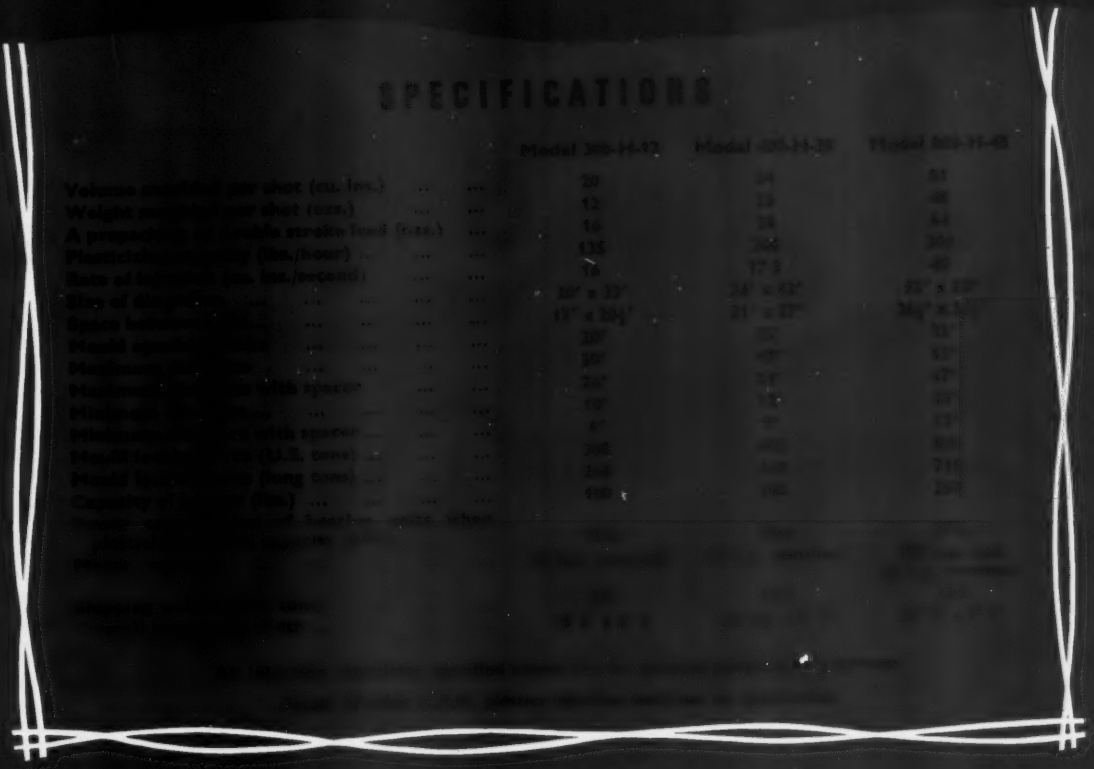
at lower cost per shot

Step up production with H.P.M. machines — the fastest injection moulders producing thermo-plastic parts at lower cost per shot than any other machines of comparable size.

They are fully automatic "all-hydraulic" machines possessing many outstanding features providing faster cycle times, powerful clamping and easy set-up, accurate material feed and high plasticizing capacity.

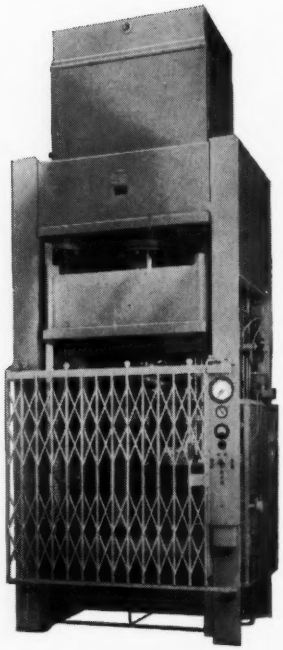
In addition, they are economical with labour, floor space and material, and are dependable too. The machines range in size to meet every moulding need, and each unit is backed by over seventy years' specialist service.

PLASTICS INJECTION MACHINES

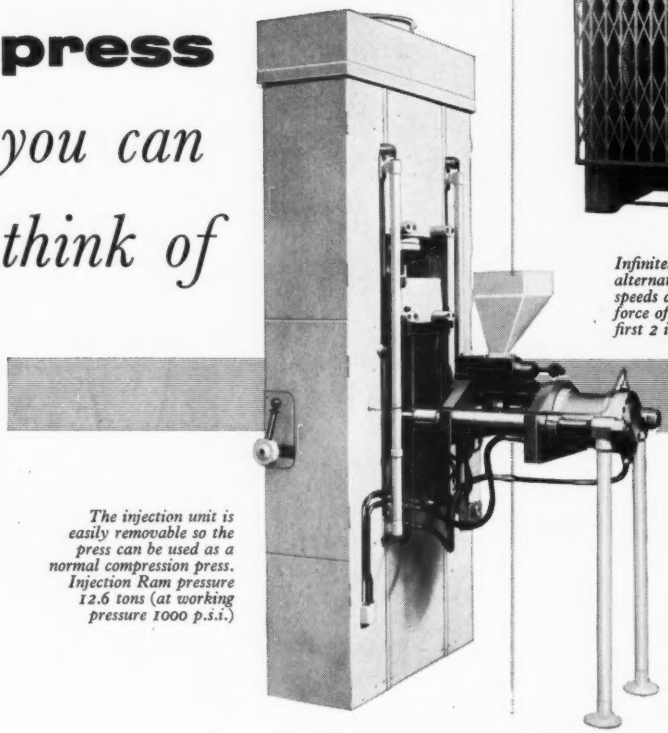


W I C K M A N L I M I T E D

BIPEL MAKE *every kind of* compression press *you can think of*

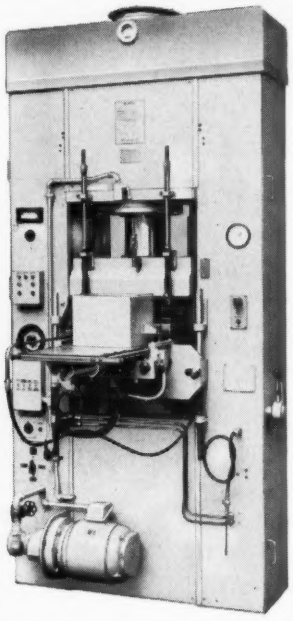


Infinitely variable pressure 10-50 tons or, alternatively, 10-150 tons. Three closing speeds and a high initial mould parting force of 25 tons for the first 2 in. of rising



The injection unit is easily removable so the press can be used as a normal compression press. Injection Ram pressure 12.6 tons (at working pressure 1000 p.s.i.)

An easily attached feeding and stripping mechanism combined with standard auto-control provides a quickly converted fully automatic press, ideal for long runs



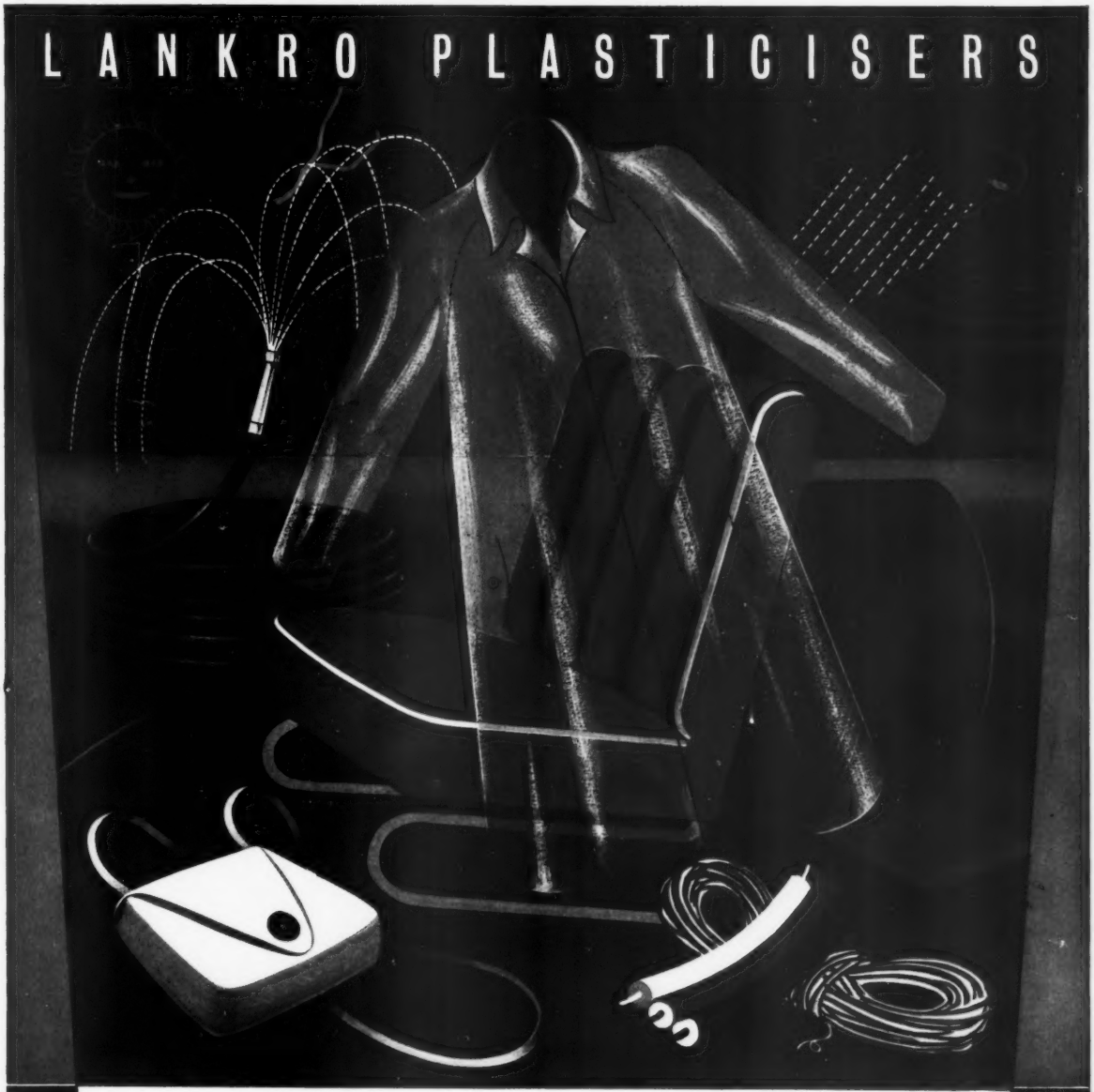
Most modern, most efficient, most economical—that in a nutshell describes BIPEL, the only *complete system* of hydraulic moulding available in this country. These clean-looking presses with all line services fed underground revolutionise shop layout, vastly increase productivity, appreciably reduce overheads. Essentially adaptable, dual-purpose variations on basic models are available for compression/transfer, and compression/injection moulding; all types incorporate auto-control of the moulding cycle, there is a fully automatic model and any model will be adapted to suit your special needs.

With individual or central drive units and a complete range of pelleters, *only BIPEL*—designed by moulders for moulders—*can give you this essential flexibility.*

The **BIPEL** *system of hydraulic moulding* B·I·P

B.I.P. ENGINEERING LTD., Streetly Works, Sutton Coldfield. *Telephone:* Streetly 2411.

LANKRO PLASTICISERS



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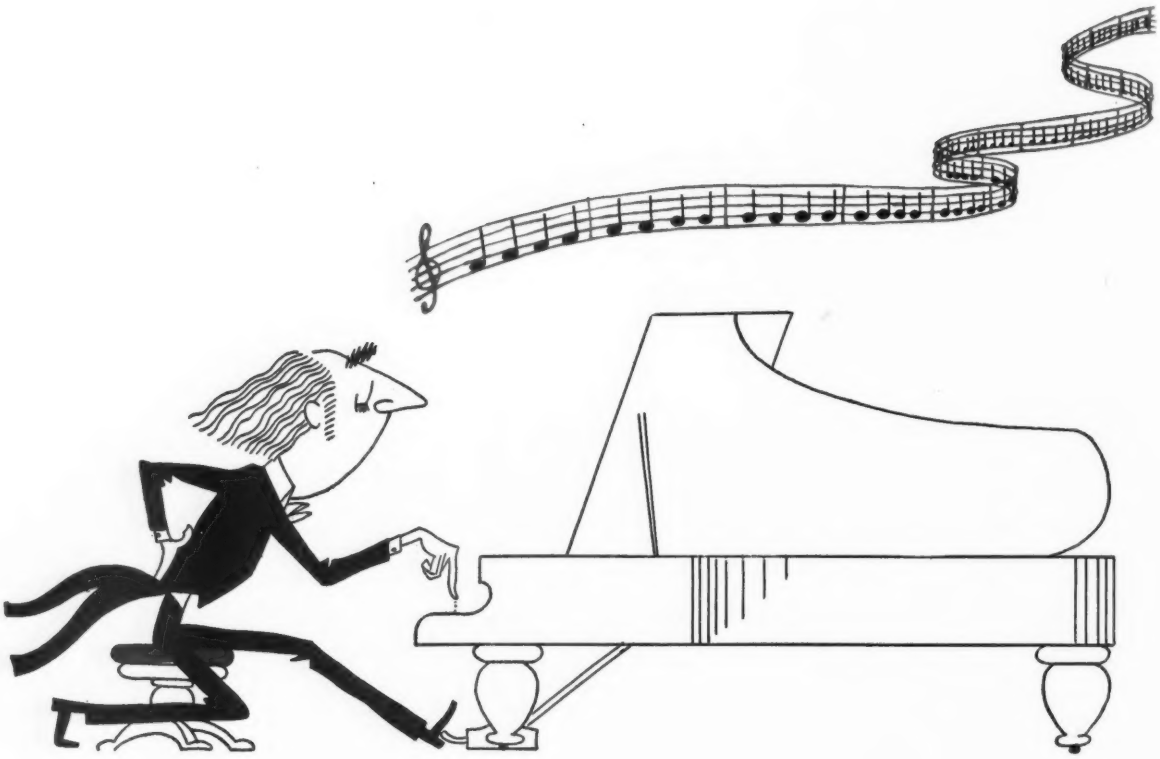
LANKRO CHEMICALS LTD., ECCLES, MANCHESTER, TEL. ECCLES 5311-5316



Theme without variations

WITH THE MASTER TOUCH

Whatever the theme, Derwent Plastics will reproduce it in any quantity—da capo, senza variatione!

Derwent Plastics are masters of precision repetition in plastic. And, classically simple or modernly monstrous, the shape is as faithfully followed as Lady Godiva's was by Peeping Tom.

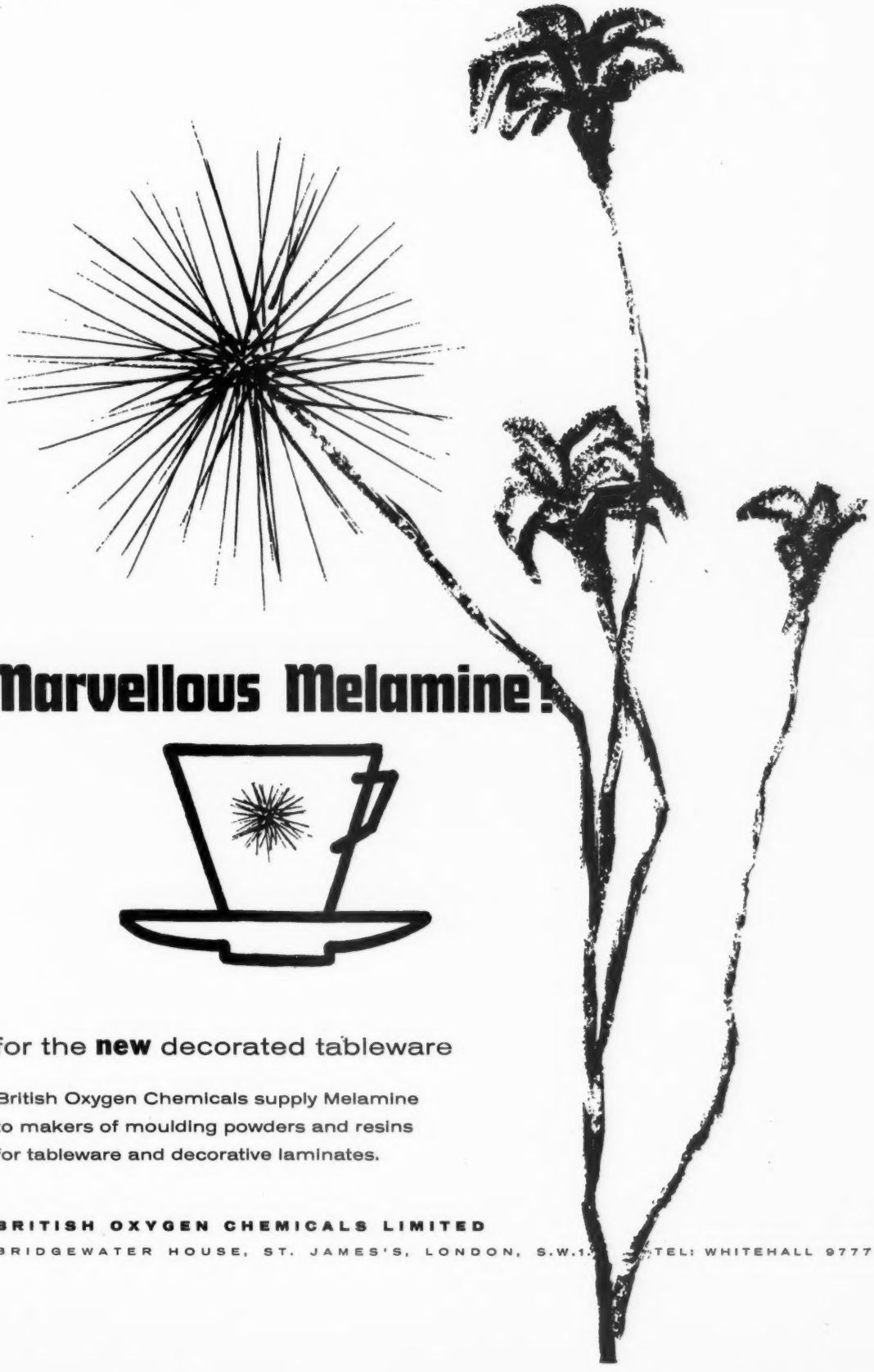
For sweet music in your cost accountant's ears, let Derwent Plastics process your mouldings. The Technical Director will be happy to discuss specific production problems.

Precision moulding by

Derwent Plastics Ltd

STAMFORD BRIDGE · YORK
Telephone: Stamford Bridge 294

ndh 10717a



Marvellous Melamine!

for the **new** decorated tableware

British Oxygen Chemicals supply Melamine
to makers of moulding powders and resins
for tableware and decorative laminates.

BRITISH OXYGEN CHEMICALS LIMITED

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Lustrex — a Monsanto plastic helping industry — to bring a better future closer

Boot studs moulded in Lustrex T11 by Carr Fastener Co. Ltd.

Lustrex T11 – tougher than any other polystyrene

In common with all other grades of Monsanto Lustrex, T11 is a HIGH-QUALITY polystyrene. Add this to its unique toughness, and you have the ideal polystyrene for producing first-class mouldings showing greatest impact strength.

* Lustrex T11 does not require special moulding techniques.
* Lustrex T11 is available in a wide range of standard colours; or, special colours can be accurately matched within a few days.
* Advice on how production efficiency can be improved will gladly be given by our technical experts.
* There is a grade of Lustrex for every job in polystyrene.

MONSANTO CHEMICALS LIMITED
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ELCO PLASTICS

LIMITED

PLASTIC MOULDINGS

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EXTRUSIONS

MODERN TOOL ROOM
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ON
PREMISES

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HIGH WYCOMBE BUCKS

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LIMITED

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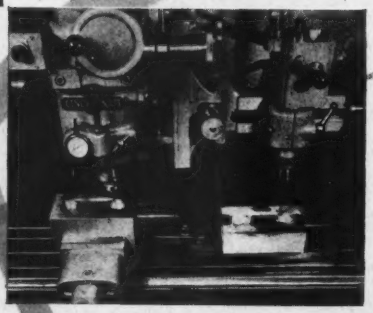
THE CINCINNATI 8" x 18" TOOL AND DIE MILLING MACHINE has all the features necessary for rapid, accurate and economical production of small moulds and dies from almost any type of master. The illustration shows a left-hand die being made from a right-hand master.

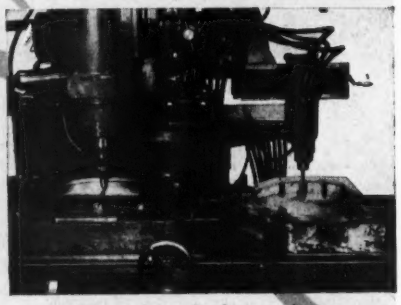
Milling a die for a toy telephone receiver, using a plastic master. The 8" X 18" Tool and Die Miller is described in catalogue M-1620-E.



CINCINNATI MACHINE TOOLS for the PLASTICS INDUSTRY

CINCINNATI 16" VERTICAL HYDROTEL for machining medium to large sized moulds. Catalogue M-1497-E.

May we tell you more about these Cincinnati Machine Tools? The catalogues contain complete information on their features and the important advantages they offer to the plastics industry.



Milling a large die from a plaster master, on a **CINCINNATI 3[illegible] VERTICAL HYDROTEL.** Catalogue M-1773.

CINCINNATI MILLING MACHINES LTD.

Birmingham 24.

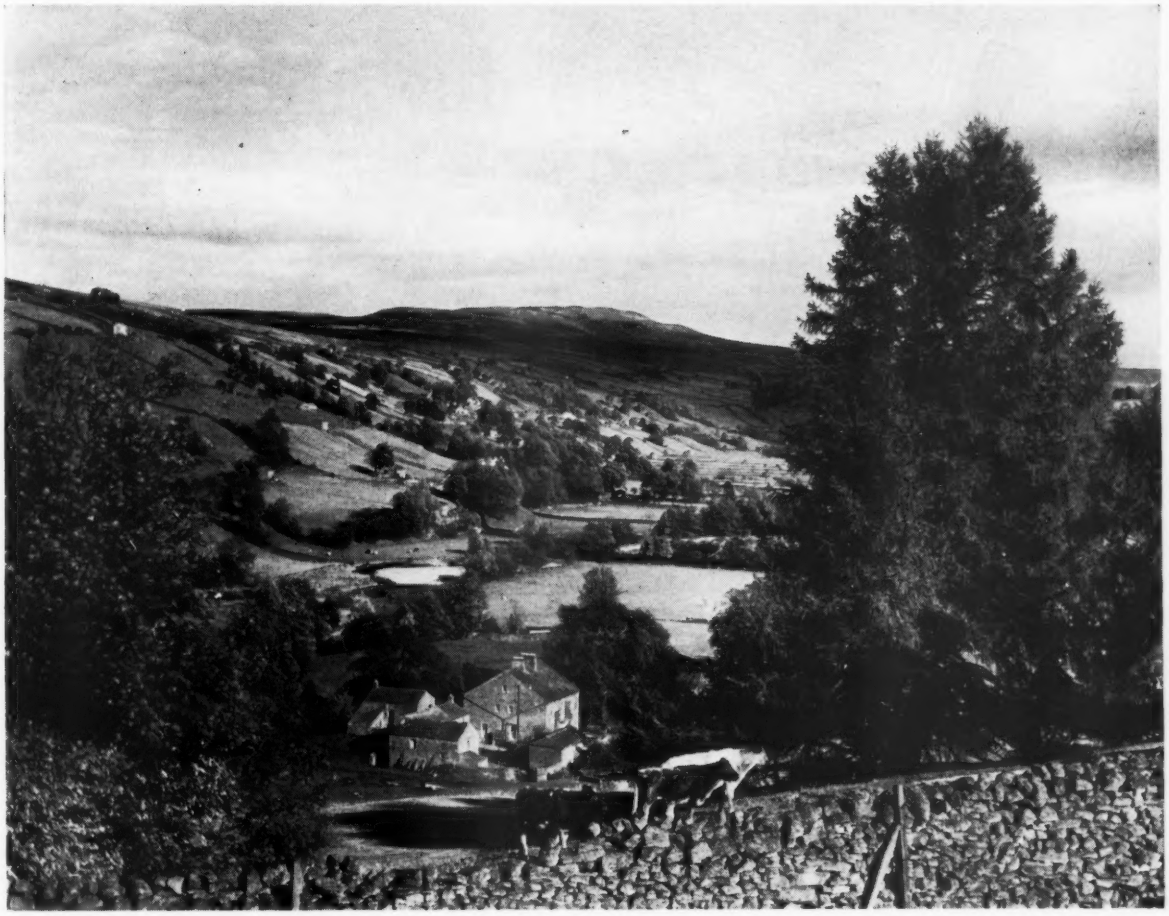
Sales Representatives for Great Britain and Northern Ireland: Chas. Churchill & Co. Ltd., Birmingham 25.

Beautiful Yorkshire.

PLASTICS ELO PRODUCTS

Swaledale near Low Row

BIRKBYS LTD · LIVERSEDGE · YORKSHIRE



"ELO" SYNTHETIC RESIN PRODUCTS

"ELO" MOULDINGS for all classes of industry
High grade "ELO" MOULDING MATERIALS

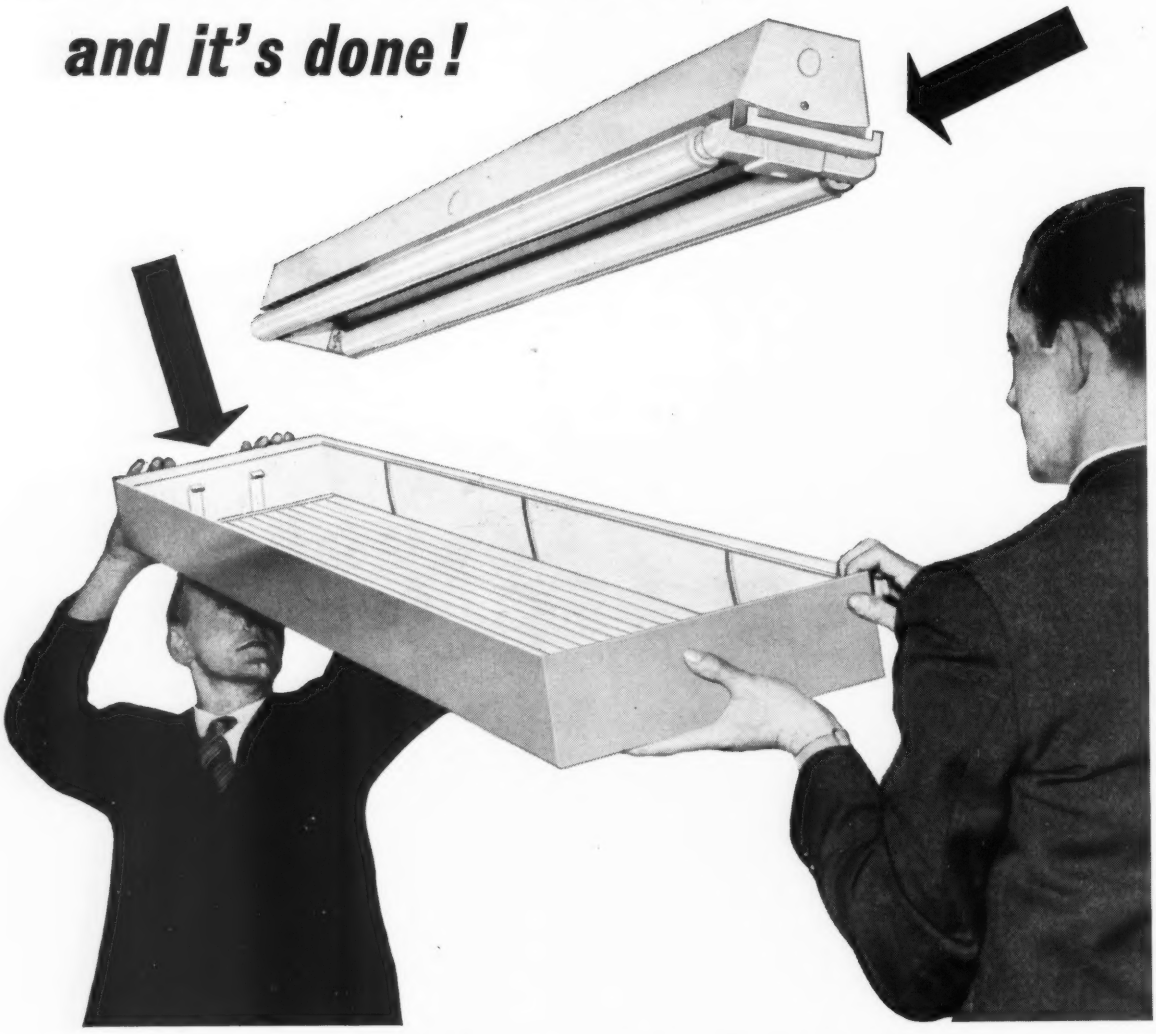
"ELO" RESINS for all Bonding, Laminating, Abrasive, and Friction material applications. Anti-Friction Resin for Fabric Bearings. Resins for Textile Paper Tubes and Bobbins. Cements, Lacquers, Insulating Varnishes.

London Office: 79 BAKER STREET, W.1.

B

hook diffuser on brackets...

and it's done!



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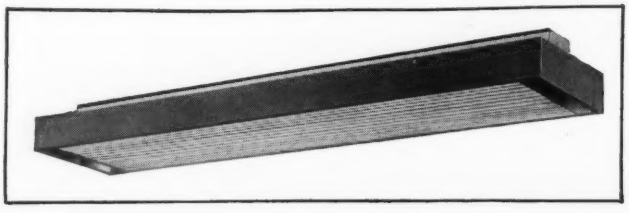
fluorescent fittings

Discreet diffused fittings for the Chairman's office. Steel or 'Perspex' reflectors for the factory. Handsome louvred fittings, like the one illustrated, for shops or stores. Dozens of different designs, decorative or strictly functional. Sizes from 1½ ft. to 8 ft. single or twin lights. The range is wide, the choice is yours—but one thing they will all have in common is this G.E.C. basic channel —the basis of a hundred and one different light fittings. Economical to install, simple to fit, easy to maintain —the brilliantly successful '101' range—the reality of a complete lighting service. Send for profusely illustrated catalogue.



THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

WILL THAT METAL BE FOUND

by your calender...

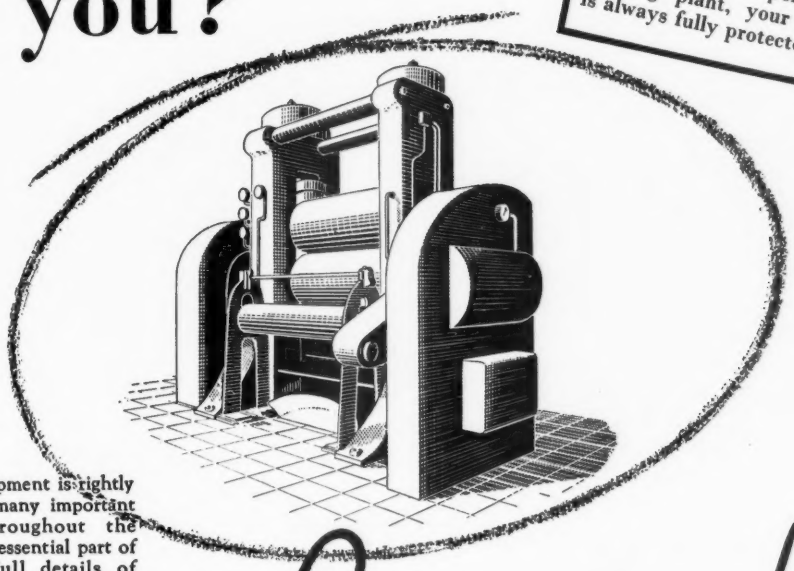
or you?

Metal in Plastic Mix

ANY small piece of metal in the plastic mix can cause untold damage to expensive plant and machinery.

Far better that it be found by the CINTEL Electronic Metal Detector, which will detect any metal, ferrous or non-ferrous, and give warning of its presence, before damage can ensue.

With CINTEL Equipment, which can be incorporated into existing plant, your calender is always fully protected.



CINTEL Equipment is rightly regarded by many important concerns throughout the country as an essential part of the plant. Full details of CINTEL Electronic Metal Detectors will gladly be sent on request.

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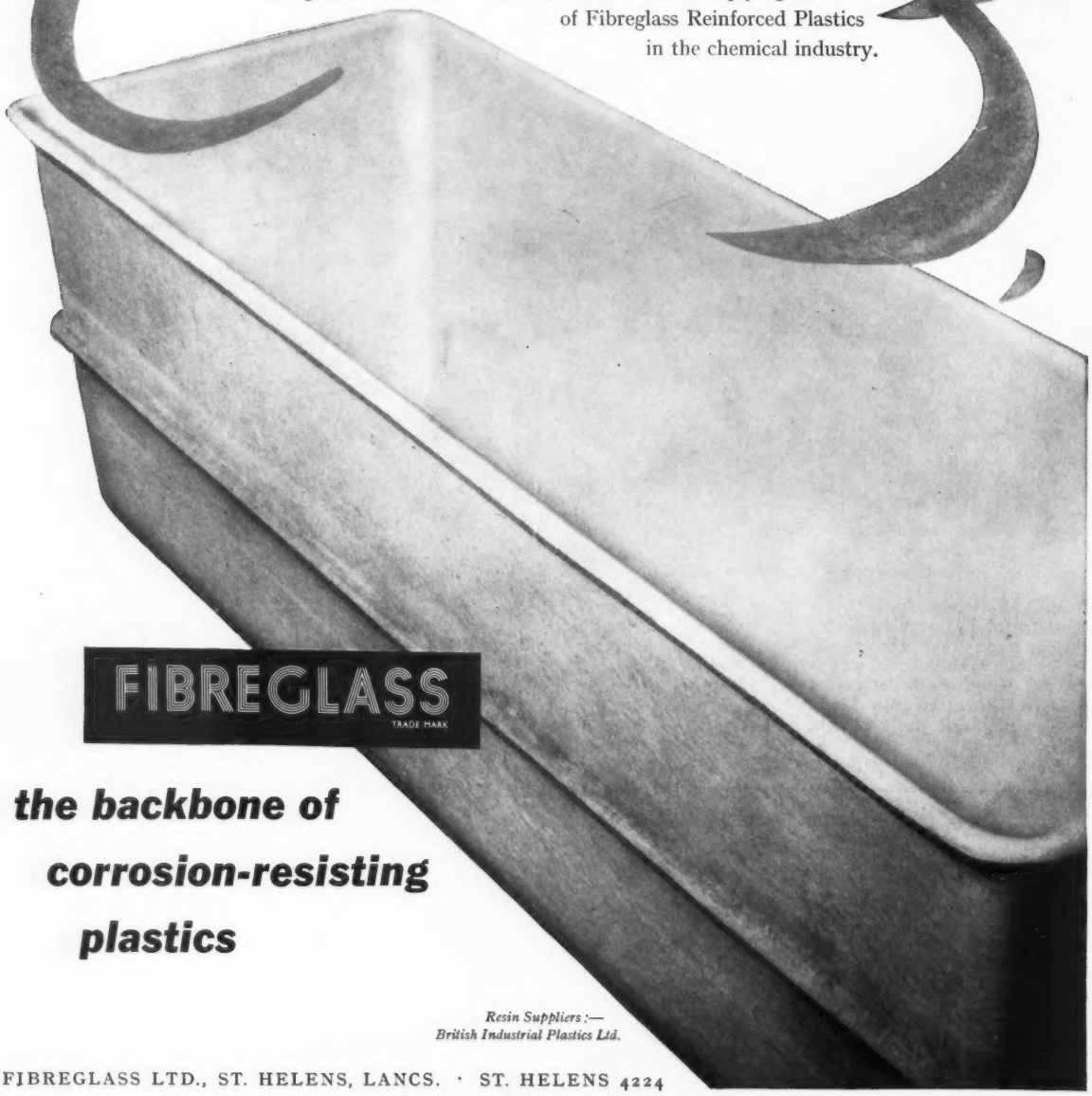

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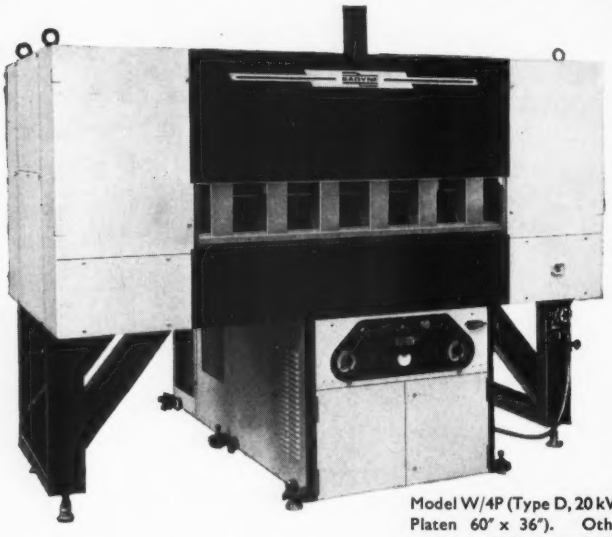

Model W/4P (Type D, 20 kW, Platen 60" x 36"). Other models available from 6 kW, platen 42"x 26".

Radyne general-purpose open-span electronic bonding press

Model W/2P
Output 6 kW.

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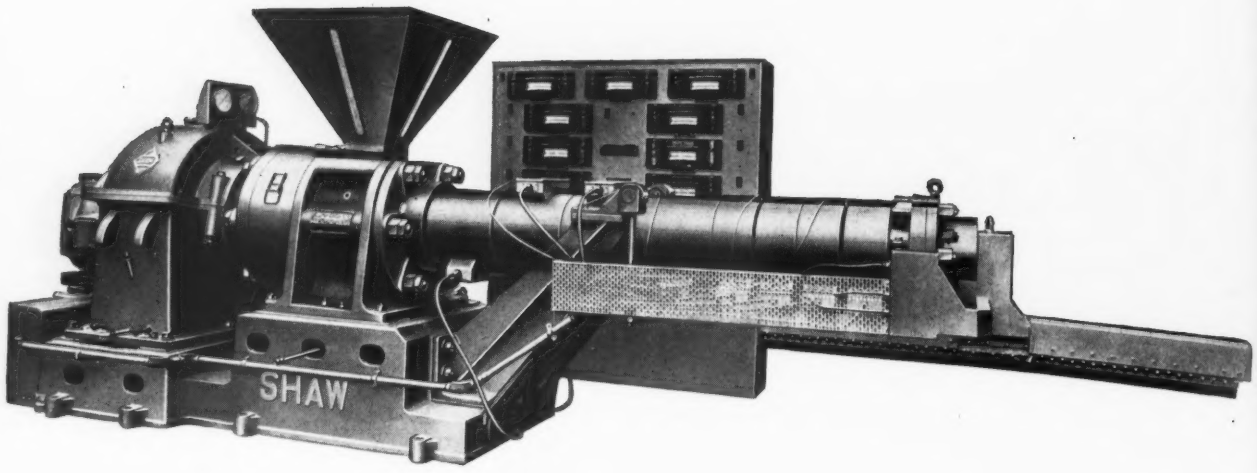

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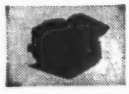

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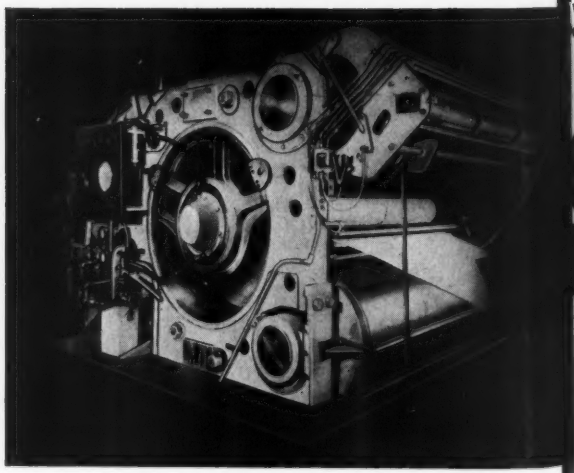

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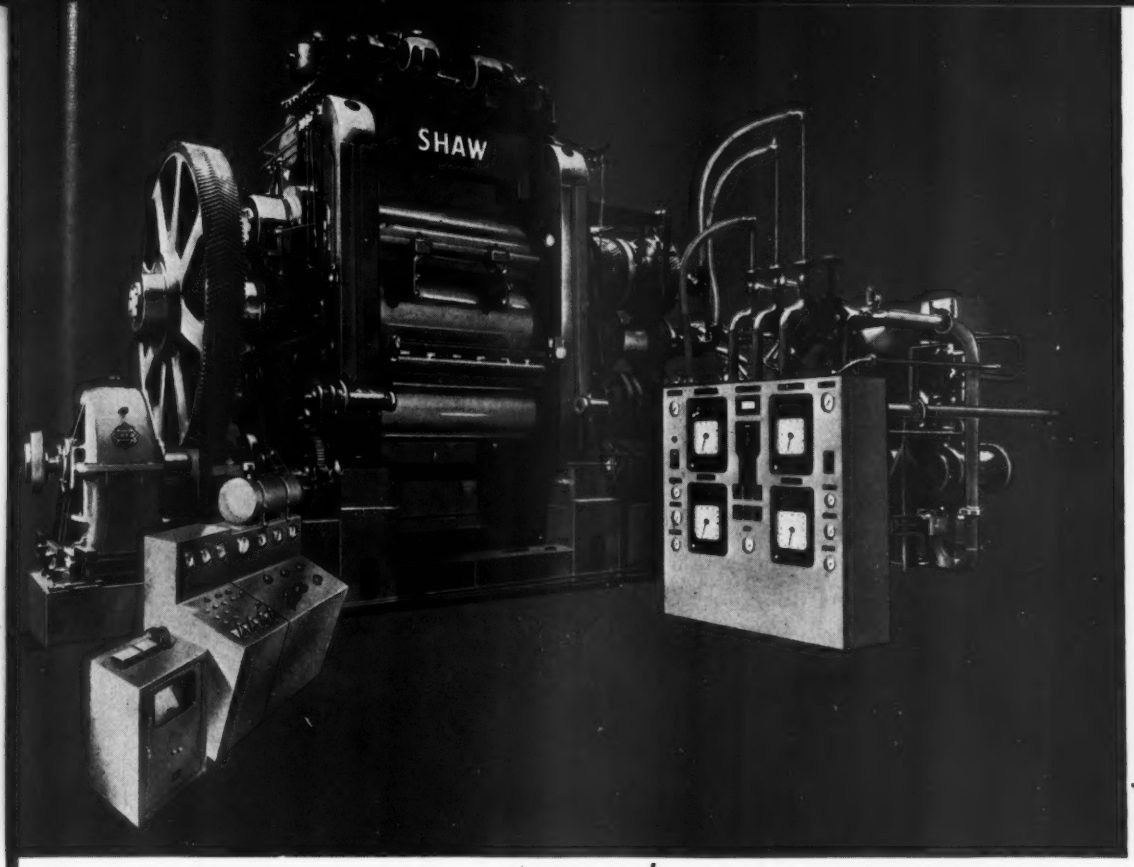

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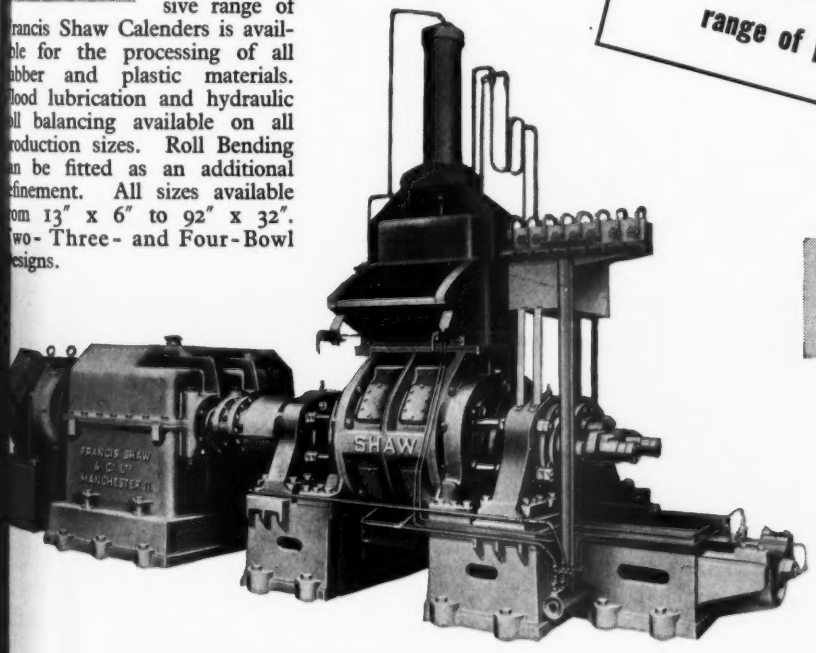

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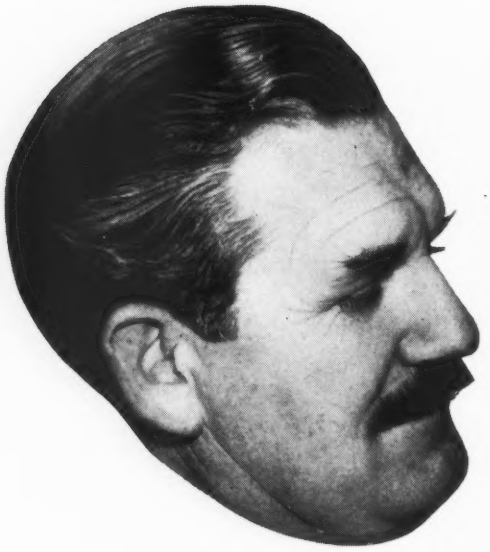

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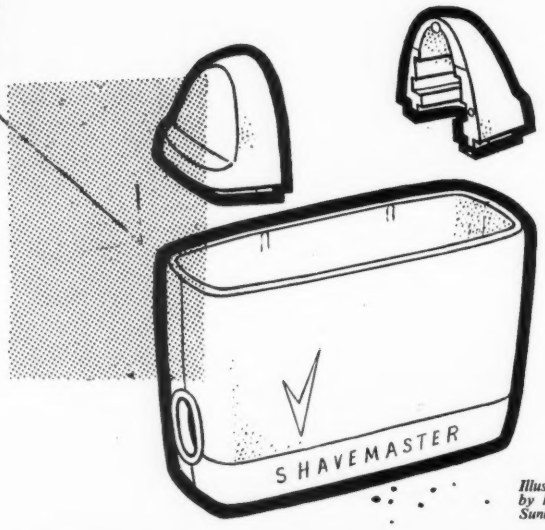
Your enquiries would be welcomed.



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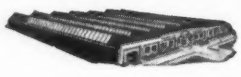

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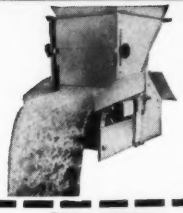
Velofeeder discharge rates can be adjusted in seconds from tons to pounds an hour within a 400-1 ratio.



I want feeders that can be relied on to maintain their output accurately.

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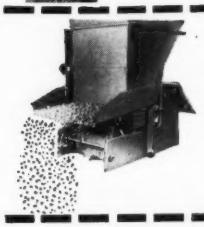
When set to a precise flow, Velofeeder output is unvarying.



I want feeders that can be reset quickly for repeat runs.

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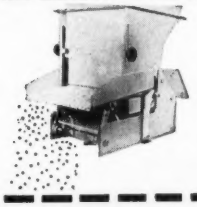

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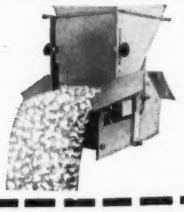

I want feeders that run cheaply and quietly.

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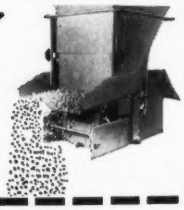

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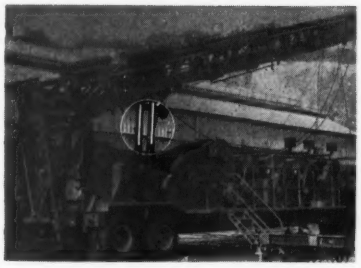
...better have it Toolchromed!



A typical example of the Toolchrome Service is this hydraulic equipment illustrated here by kind permission of Messrs. Woodfield Hoists Ltd. of Rochester and finished to this high standard by Toolchrome craftsmen.

by "Resistance to Wear" we mean, of course, the diamond-hard surface which, when applied to surfaces required to stand up to the abrasive action of certain plastics materials or the incessant friction of reciprocating action as in hydraulics, increases their useful life many times over. Such a surface is hard chromium, well known in the plastics and engineering field for many years; well known also is the fact that the deposition of hard chromium is a specialist's job, and Toolchrome enjoy a reputation for being masters in this field, offering a service second to none. So when the call is for "Resistance to Wear," for hard chromium in fact—have it Toolchromed.

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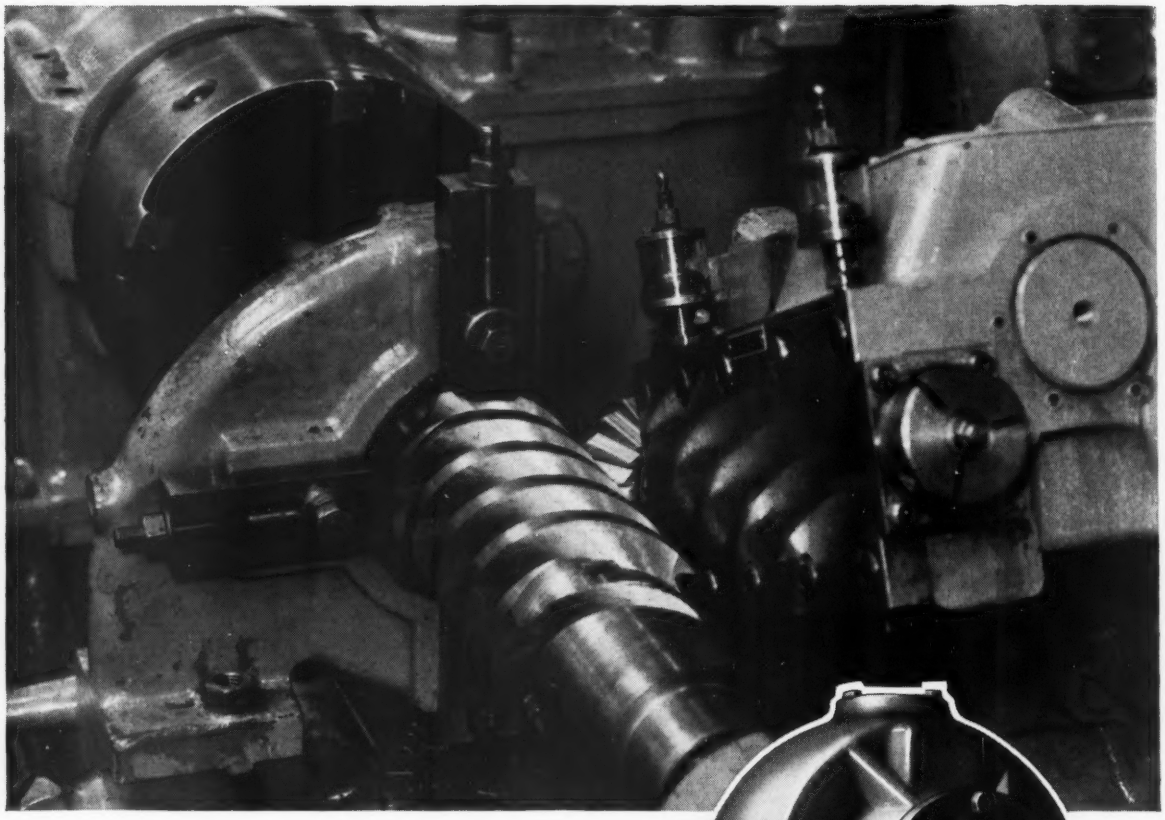

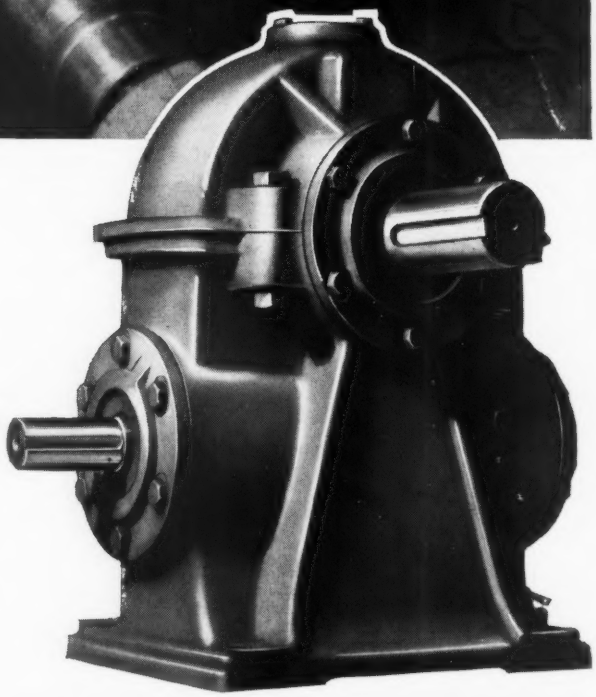

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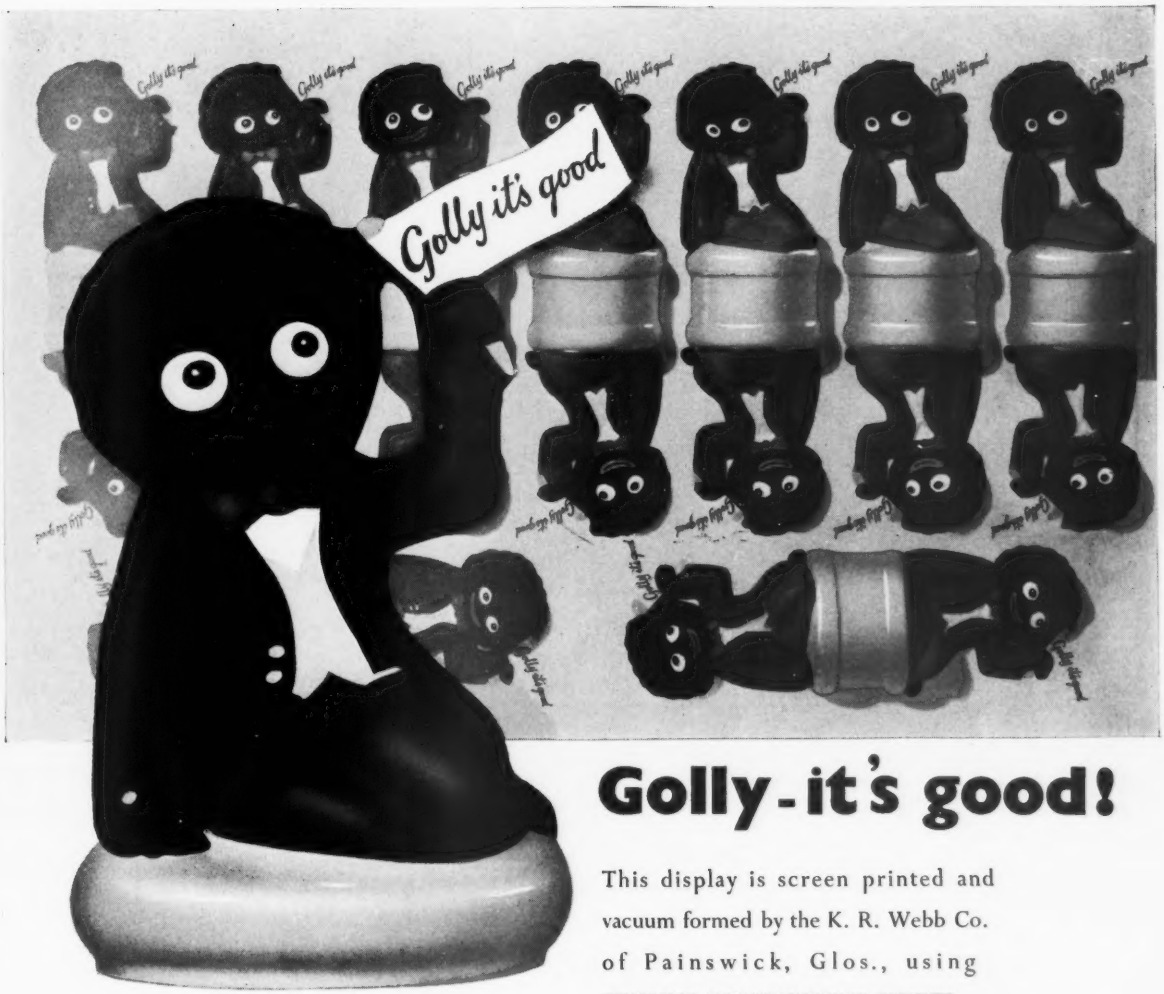

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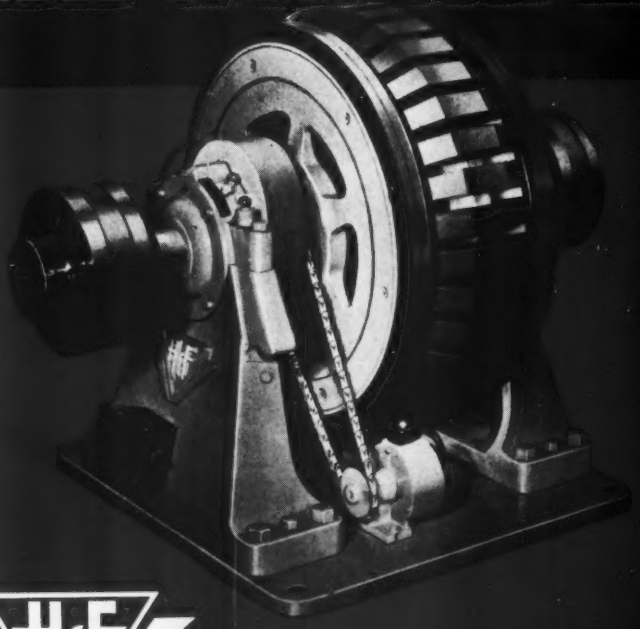

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the home — your mass market! 5

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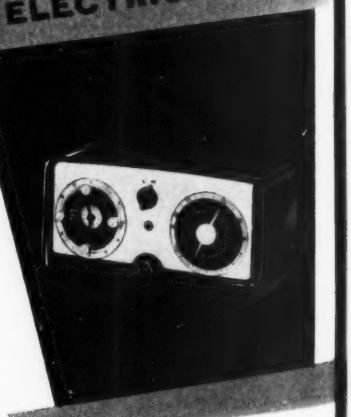

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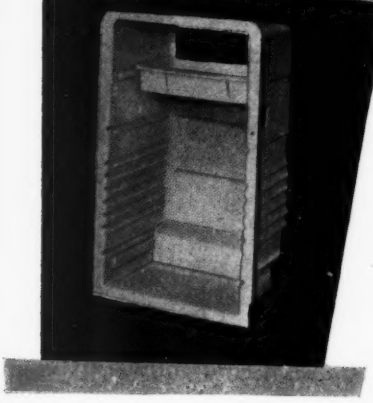
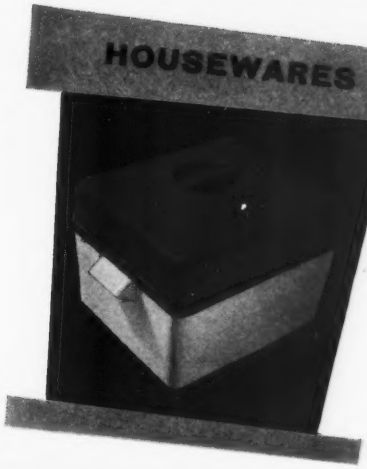
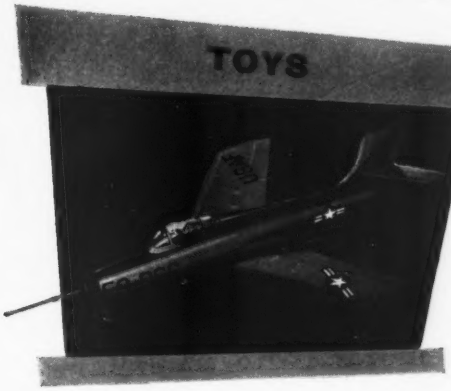


HOUSEWARES



TOYS



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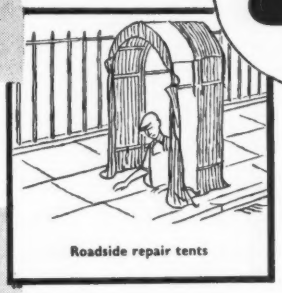
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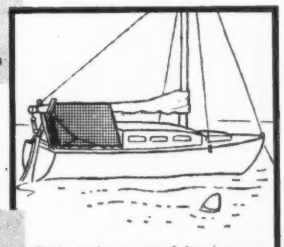
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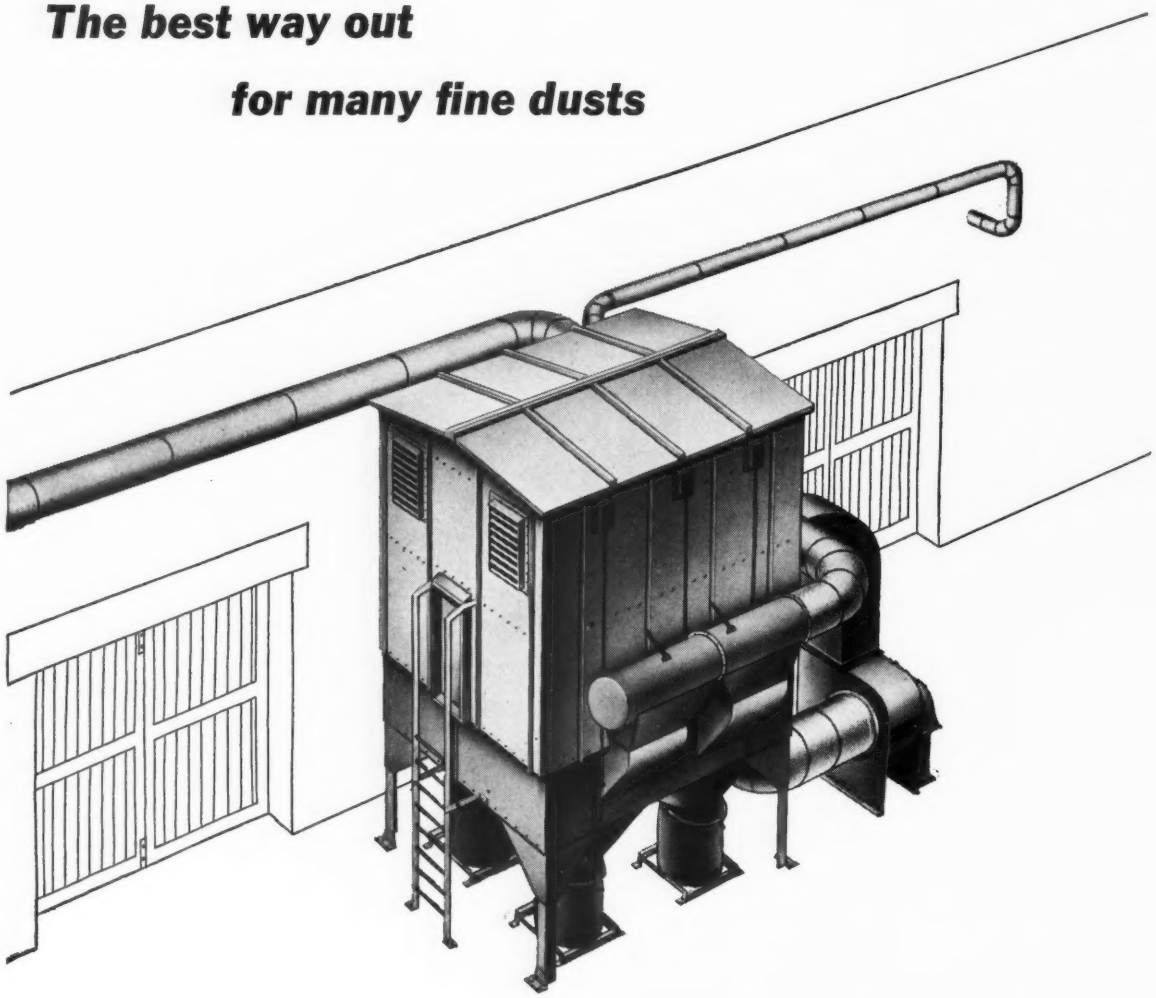

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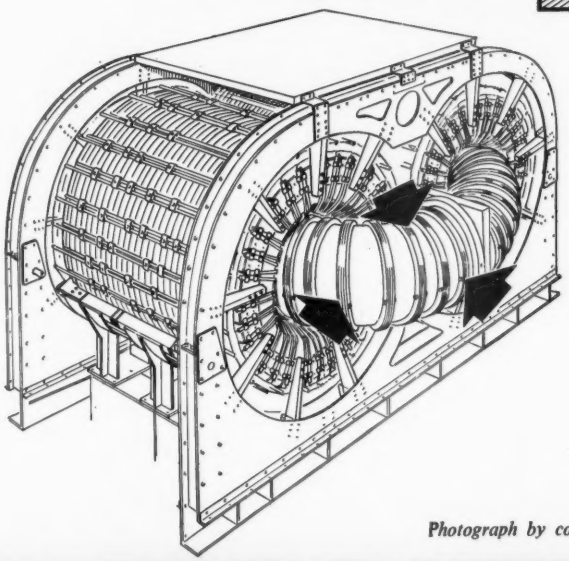
TURNERS DURAGLAS for Zeta



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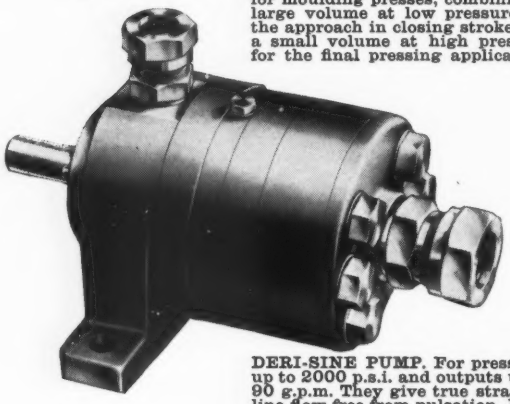

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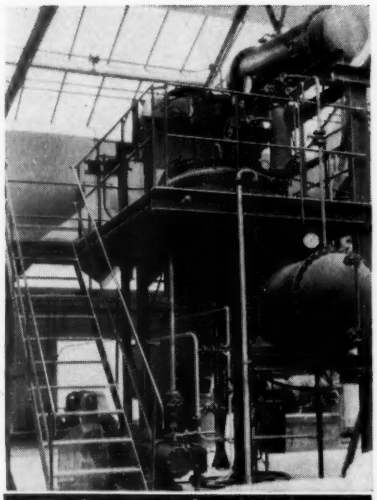
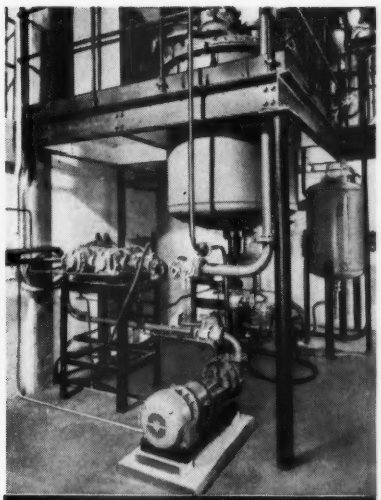
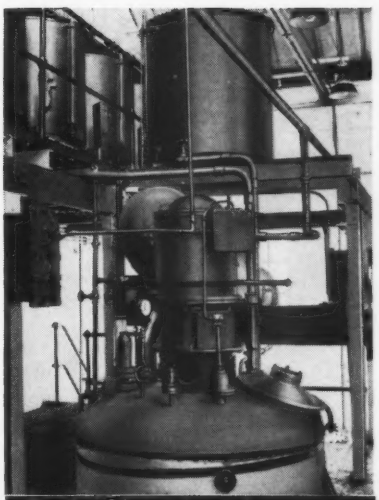


250 gallon phenol formaldehyde resin distillation plant.



Alkyd resin plant in a large paint factory.



Details of large phenol formaldehyde resin making kettle.

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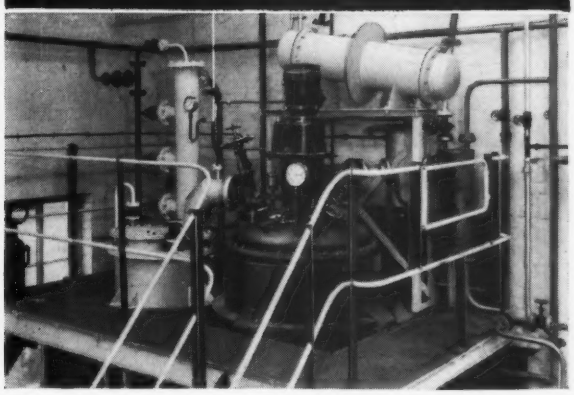

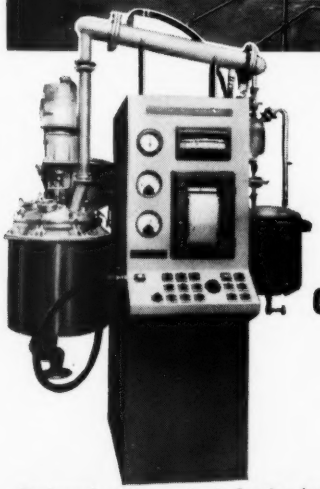

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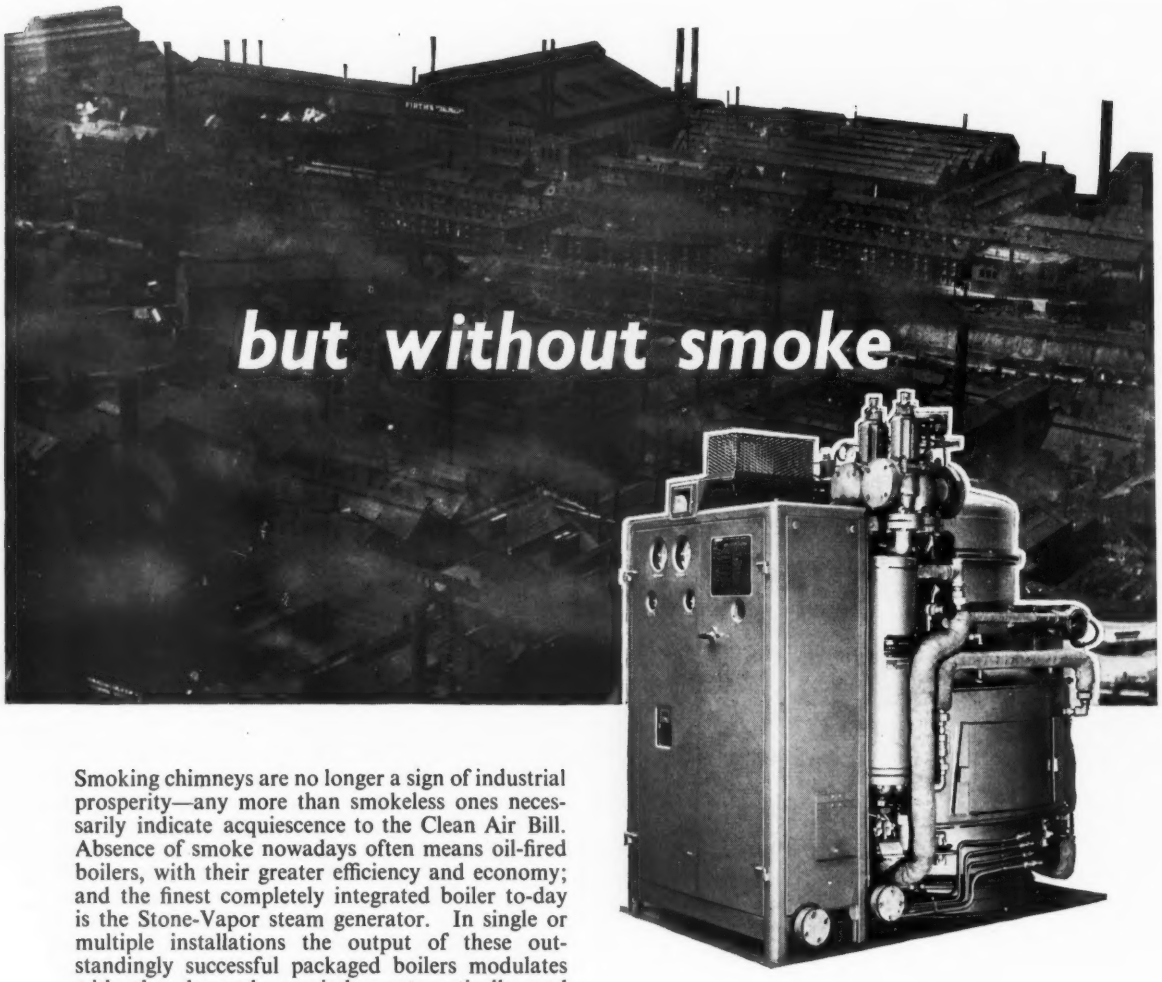

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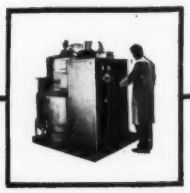

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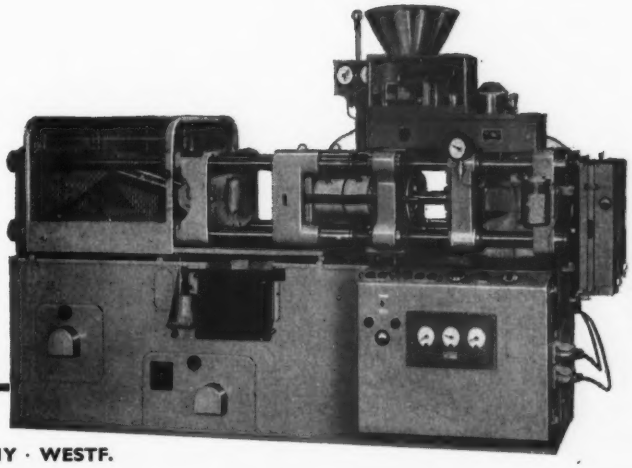

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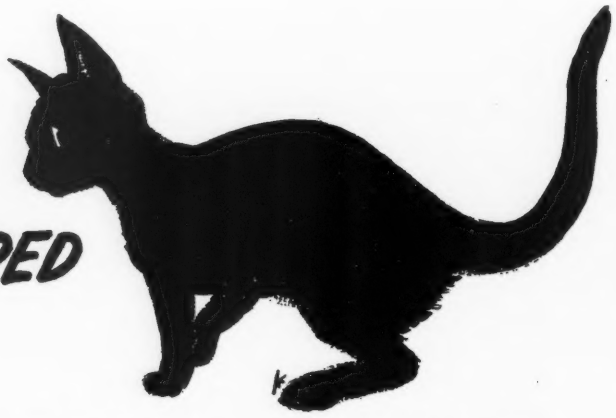

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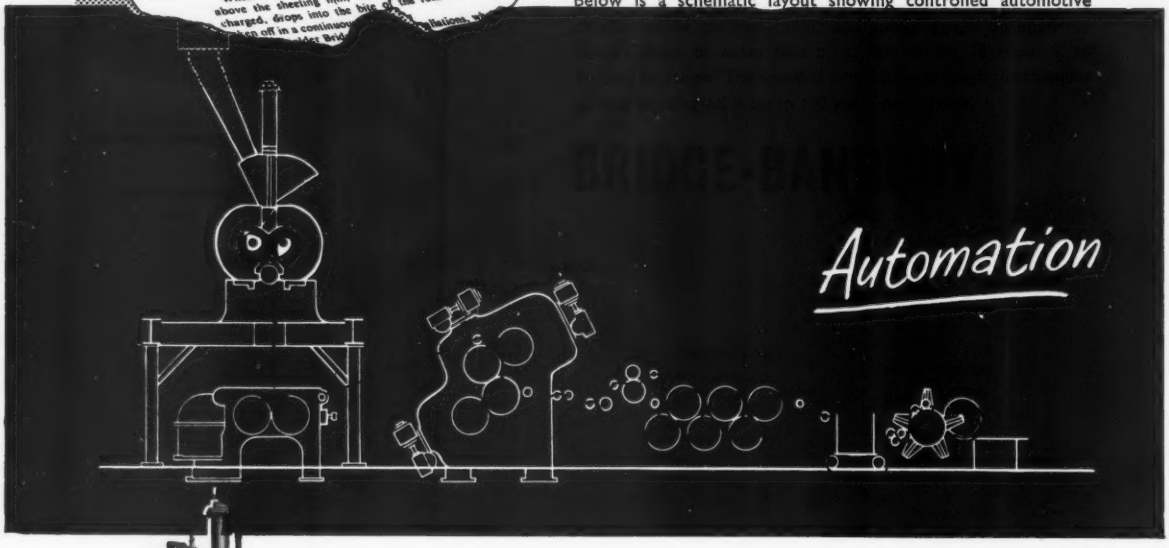

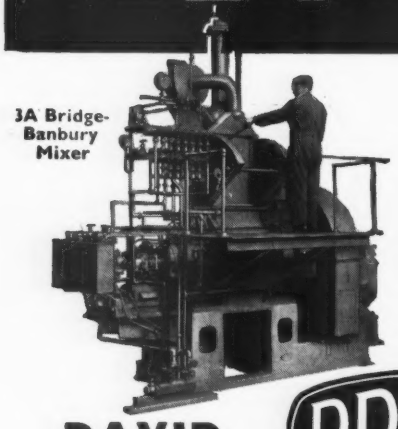

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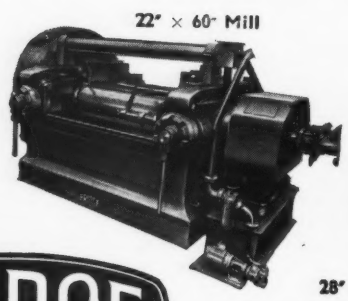
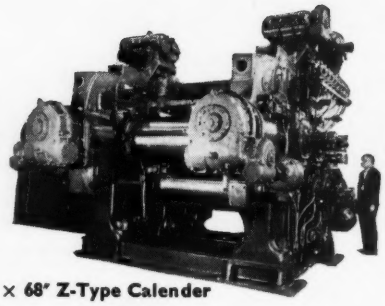


22" × 60" Mill



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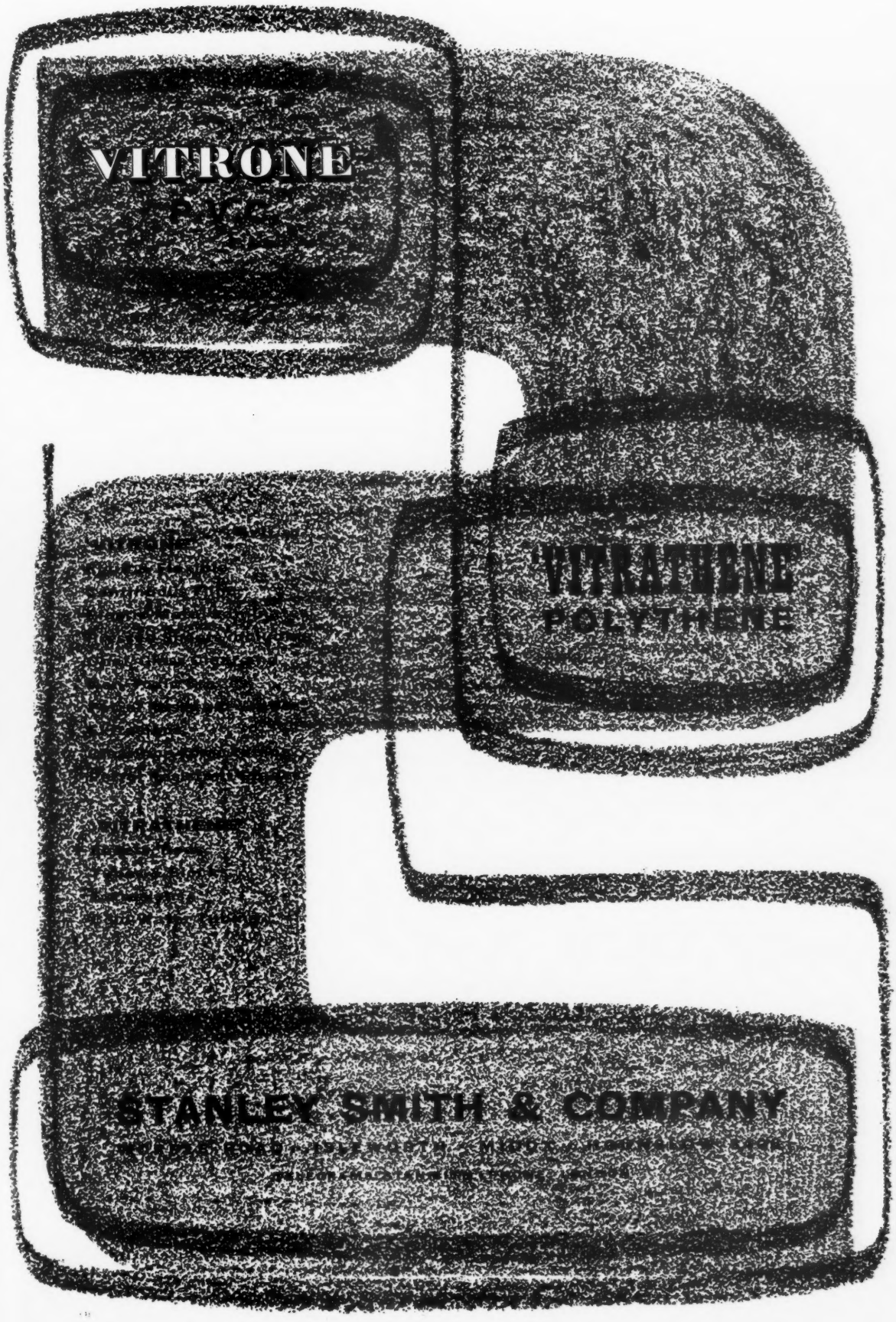
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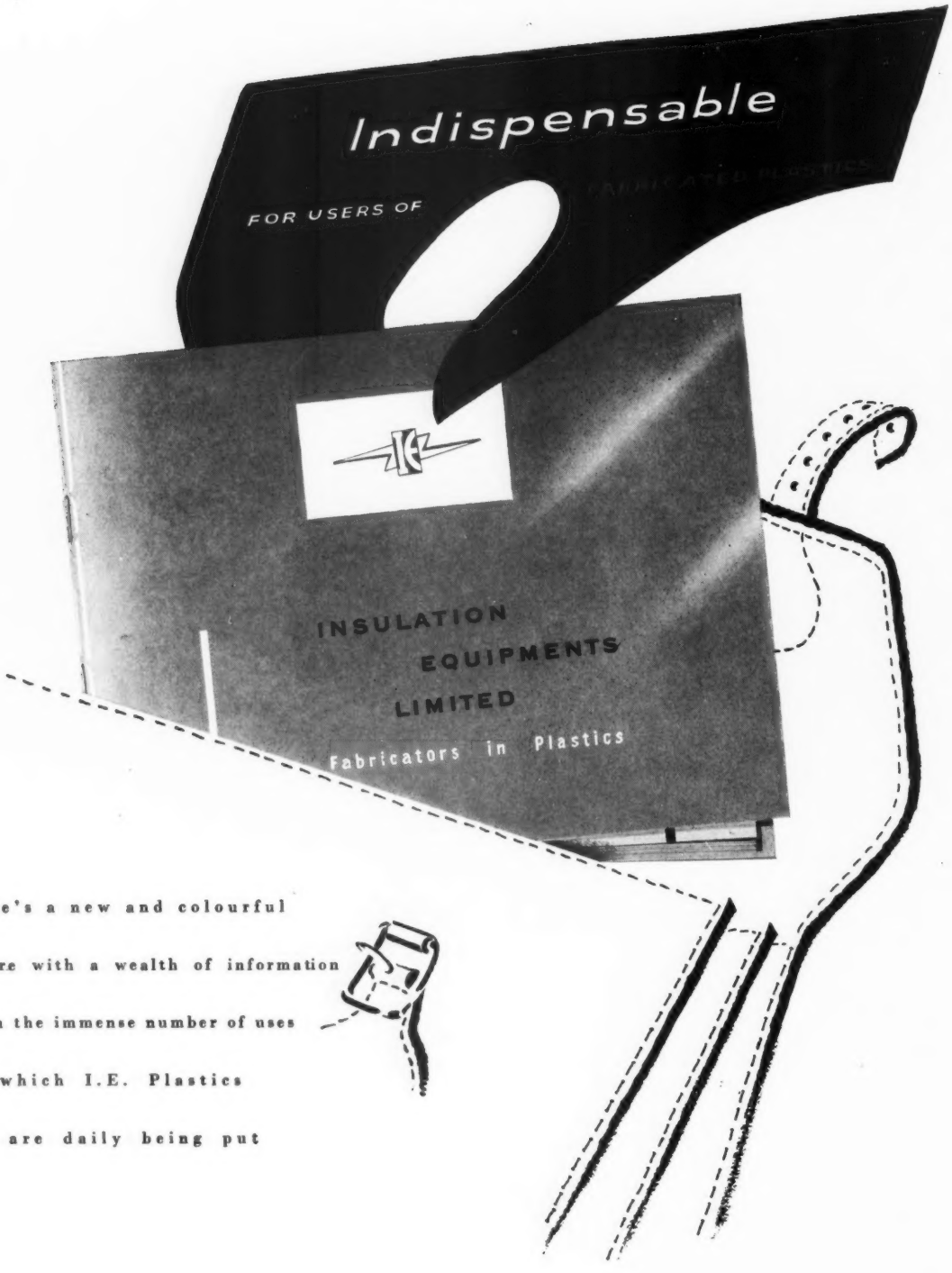

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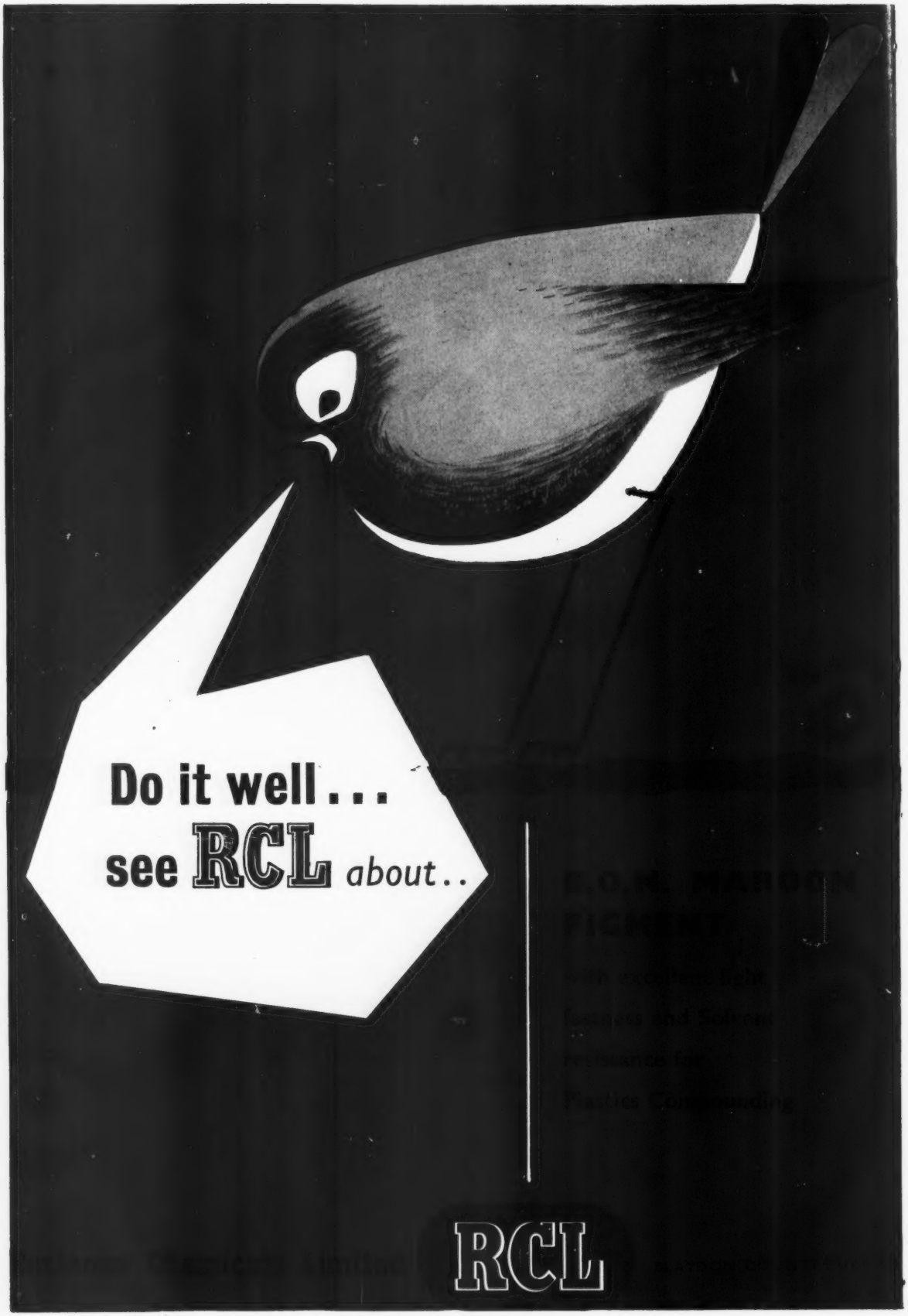
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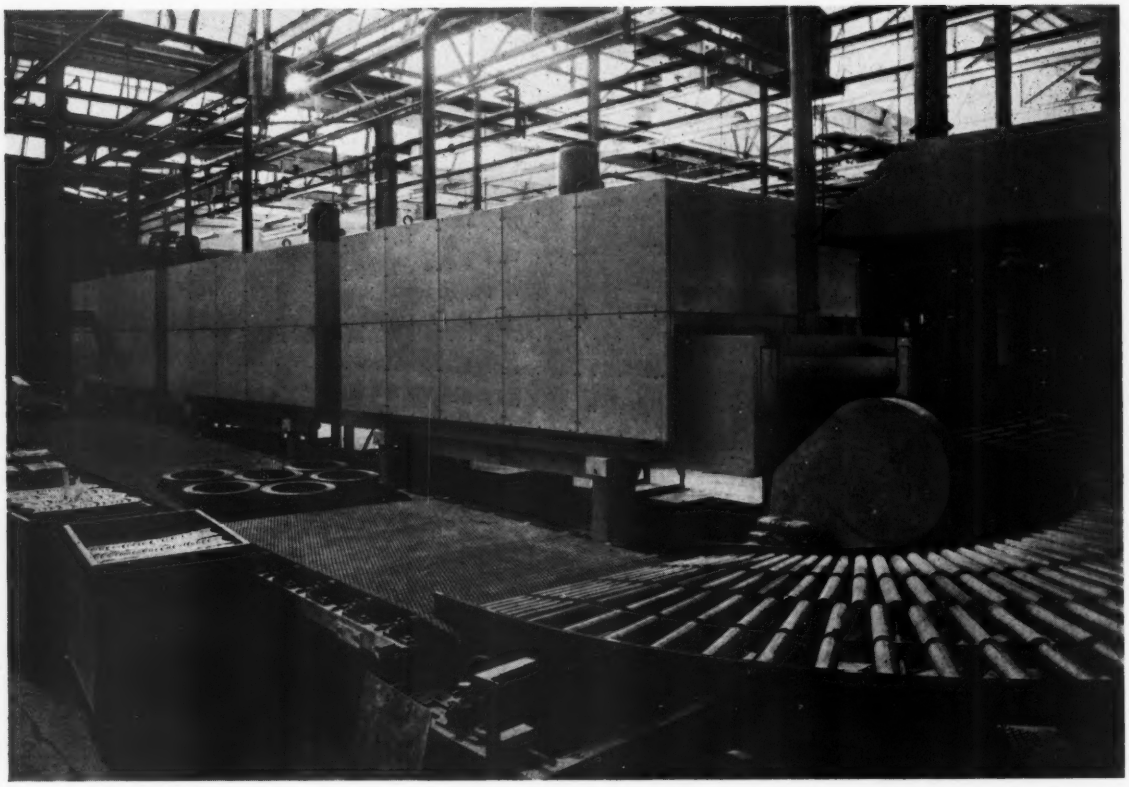

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Photo by courtesy of Ferodo Ltd.

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Hall 6, Hannover Trade Fair, housing the chemical exhibits.

EDITOR: M. D. CURWEN, B.Sc., F.R.I.C.
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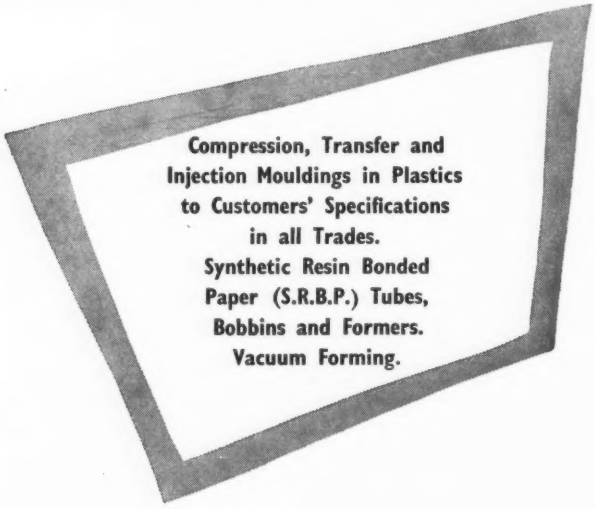

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Plastics

VOL. XXIII No. 249 JUNE, 1958

EDITORIALS

The New Telephones

THE recent announcements by the Postmaster General brings to mind two facts—that the Post Office is certainly the biggest single customer of the plastics moulding industry and that the way to make a profit by the Post Office is to make telephones cheaper and not dearer. Furthermore we suggest that the refreshing wind blowing from this Government Department foretells vastly improved efficiency to industrial and general communications, an extension in the use of telephones, and further prosperity to the country in general and to the plastics industry in particular. We are grateful in the knowledge that by 1970 three-quarters of all trunk-calls will be dialled by the subscriber and that a 30 second trunk-call costing 2d. to any part of the country will be introduced in January, 1959, in Bristol and steadily extended.

This news is indeed heartening. There is also much technical news that appears almost contemporaneously.

" In the beginning " the first telephones consisted of wooden structures supporting separate ebonite mouth and ear-pieces. These were followed by phenolic mouldings and about the 1940's cellulose acetate with its higher impact value was employed for the cradle of that period. During the past two years extended tests have been carried out on evaluating the relative merits of the more recent high impact polystyrene on the one hand and on the " new " Diakon moulding powder which we described in our May issue.

Two months ago we published a detailed report entitled " The New Diakons." In it was described the fruits of many years research by I.C.I.'s Plastics Division into methods of manufacturing a cheaper and more easily moulded and extruded material. The report indicated the broad applications which lay ahead for the new grades of I.C.I.'s acrylics, with one important omission, necessary because a Minister had still to make a final decision.

This decision has now been taken, and it is that Diakon shall be used in the new General Post Office telephones. It is a tremendous success for the research and technical service departments of I.C.I. and for the technical staff of Ericsson Telephones Ltd., who together have been working on this project for nearly 18 months.

Some account of the background to this important development should be given, for it illustrates the importance of persistent research and faith in a materials potentialities.

When Diakon, as the injection moulding grade of Perspex, was introduced in 1936, it was the third thermoplastic in the field (predecessors were cellulose acetate and polystyrene). If the injection process prospered, so also would Diakon. In fact, the material " moved " very slowly, hampered in its natural development by the war. By 1957, 20 years later, it had still not achieved a position of any importance, and manufacturing difficulties inhibited any significant drop in price.

In that year, however, experimental work at Welwyn showed that for the first time a polymer grade (virgin Diakon, uncompounded) could be successfully moulded. This, coupled with other research threw an altogether more favourable light on the Diakon scene, and a decision was reached to build a new plant. This tenacity in maintaining a material on the stock list for 20 years with little commercial encouragement is at last rewarded. In addition to the many other outlets which lie ahead there is the prestige-creating, and commercially attractive G.P.O. contract, which alone will call for hundreds of tons of Diakon each year for many years to come.

Competition for telephone contracts has always been intense. In the U.S.A. currently used materials are cellulose acetate butyrate and proprionate. In the U.K., the choice for the new telephone lay between polystyrene and polymethyl methacrylate.

The properties of the acrylic which have guided its final selection are as follows. Electrically, for telephone purposes, Diakon is as good as the material it will replace, phenol formaldehyde. Its impact strength is better and its colour range is, of course, unlimited. The feel of Diakon is smooth and lustrous, and the surface finish is excellent and can readily be repolished. The physical characteristics of the material, in terms of ageing, are extremely consistent.

Colour requirements, in terms of even distribution and smoothness were particularly important. Eight colours were selected by the G.P.O. in concert with the Council of Industrial Design and Ericsson's. The colours are deliberately not flamboyant, forming a discreet background to the decoration of an office or home.

The availability of a polymer grade has enabled I.C.I. to effect a substantial reduction in cost. The current price is 4/1d. lb., Diakon compound being 4/11d. lb. When the new plant comes into production in the latter part of this year the price of both types, it is hoped, will be further reduced.

Now that the G.P.O. has decided in favour of Diakon, it is expected that a similar trend will follow in commercial telephones, opening up a market even greater than the G.P.O. contract. It should also be possible to introduce Diakon as a telephone material in countries abroad, in Australia, in Canada, and elsewhere.

The plastics industry has for long played a vital role in the telephone industry. That the prize on this occasion has gone to the new Diakons is indicative that polymer development is more than keeping pace with the electrical refinements and service requirements in this keenly competitive business.

Exhibitions Abroad

THAT this issue of *Plastics* is somewhat larger than usual is due to the fact that last month two important exhibitions were held on the Continent, and extra pages have been necessary to report them. One, the sixth of the International Plastics Fairs held at Oyonnax, directed attention to plastics consumer goods, while the other, the Hannover Trade Fair, was used by Continental machinery manufacturers to launch a new range of equipment for manipulating plastics.

The detailed accounts in the following pages will, we hope, convey some of the important information emerging from these exhibitions. It is only necessary to remark here on the one outstanding impression we were left with as we returned home, which was the extraordinary vitality of the plastics industries of both France and Germany. As we draw nearer to the point of decision on our future relations with Continental Europe in the matter of the Common Market and the Free Trade Area, it becomes increasingly clear that in Europe we have both a large potential market and a threat of considerable magnitude. Both in the case of materials and machinery European developments have recently achieved a much faster tempo. For British manufacturers, already engaged in keenly competitive selling, the outlook is challenging and stimulating. The following pages give some indication of the dimensions of the challenge.

MOULDING POWDER AND SHOT

Here is a photograph I took at Oyonnax of a friend of mine, Georges Mermet. He's the one in the beret and he's head of the company Établissements Georges Mermet; the lady and the young man are both in his factory which is very much of a family affair. He is one of the few producers remaining in France and perhaps anywhere else, of hand-made combs, sunglasses (the lovely specimen shown at the foot of page 212 is his manufacture) and other utility and fancy goods from horn, celluloid, acetate and other plastics. He is, in fact, one of the last representatives of what seems to be a dying craft. He is what he looks like—a tremendous individualist, capable, if necessary, of doing everything in his own factory, designing a job, making a simple or intricate metal or wooden mould with his own hands, and

Craft work in France

carrying out to the end a delicate carving and its finishing. Physically, he looks like the rocks and mountains he was born among and owes no man anything. But he is an angry man now for he wants to go on making hand-made products until he dies—combs that will last for ever and yet are works of art and sunglasses that are a sheer delight to the male and female eye. He's angry and I'm on his side. So few want them now or perhaps the truth is that the world sees only the cheap things, in mean shops, stuck on pieces of cardboard by the dozen. The craft should be kept alive and not merely for " old times sake."

The products are superb. If anybody in this world is interested in high quality jobs of this sort, let them write to Georges Mermet, 17-22, Rue d'Échallon, Oyonnax (Ain), France. I'd be pleased, because I want to go and see him again, to split a bottle of wine with him and to ask him to forgive me for pushing his name forward, which he won't like very much.

* * *

All gardeners have heard of the value of black polythene film in the garden and greenhouse for containing heat and for covering lettuce, strawberries and so on, especially during the early weeks after planting and pricking out. The film is on the market at last, but Commercial Plastics Ltd. appear to have gone one better than most in marking the film with a 3 in. square white grid for easy and more perfect spacing. It came just in time for me and my lettuce and has already saved a devil of a lot of worry about watering, since the film acts as a condenser besides keeping the earth warm. What also removes a headache is the fact that no weeds grow underneath. As per directions I cut short slits in a line and put the small plants in position. I've also cut out a few circles to see if there's less tearing than the slits. Probably the most important thing to do is to devise a means of preventing the wind lifting the film. The edges should be trenched in or held down with stones. I've gone a bit further and rolled a couple of

Better Gardens with Plastics

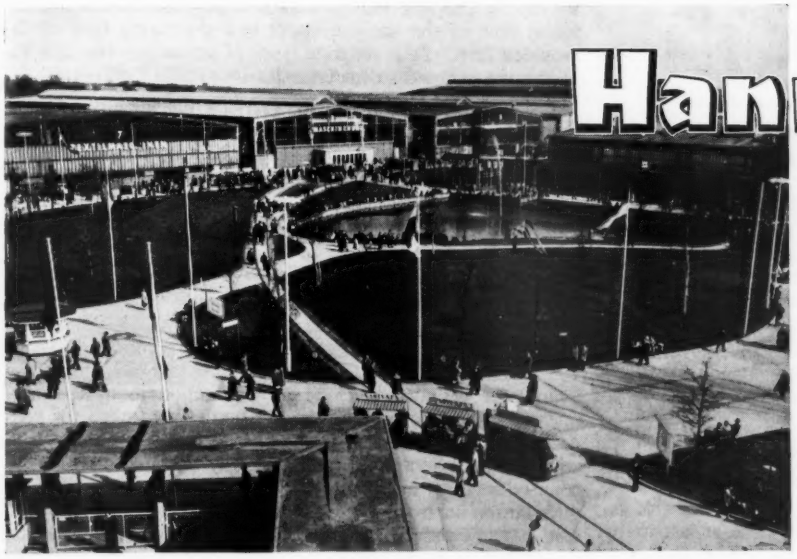
inches of the edges round lengths of thin bamboo and then trenched them in. Please note: There are 4,000 local horticultural societies in this country! What a market for the plastics industry.

* * *

It's astonishing how little some of the publicists in our industry know about publicity. Or are they merely too gullible for words? There's a little war going on to try and remove the word " polythene " from our day-to-day vocabulary —to remove it, indeed, from use in the country where both the material and the word were invented. We certainly used the word in these pages in 1937, and it is older than that, and although the public hadn't the faintest idea who " Polly " was, they soon ceased to care when they found that " polythene " was a new plastic that brought along with it a fair-sized revolution in the home and elsewhere, so far as wash-bowls, buckets, toys, packaging film and a thousand other useful things were concerned. From the publicity point of view the word is euphonious and fulfills the golden rule that it is short—it is only tri-syllabic. The " brilliant " new idea is to try and foist " polyethylene " upon us instead, a four syllable word that to us damns it altogether. But what is behind all this phony propaganda? Heaven alone knows why a 22-year-old word that has served and still serves us admirably, should be messed about. One bright p.r.o. of our acquaintance says that " polyethylene " describes the plastic more accurately. More accurately to whom? To the public? Don't make me laugh! To the scientists? More laughs! He knows now that there " ain't no sich thing." There is no plastic that is polyethylene, because however it's made, by high pressure or low pressure, this catalyst or that catalyst, there are always a few side-chains which pedantically prevent it being called polyethylene. In fact he uses the word " polymethylene " when he wants to indicate the theoretically-possible stuff. Even on grounds of chemical nomenclature, and goodness knows there are enough anomalies there already, the case for or against " polythene " is arguable. The systematic name would properly be " polyethene," and with the " e " elided we are back to where we started. Finally, and for what it is worth, British Standard Specifications acknowledge only " polythene." I seem to remember that the U.S. technical journals always used the word " polyethylene " and so indeed did the advertizers of the material in the public press. I always thought it silly to do so generically. We'd better steer clear of this mess; there'll be plenty of headaches enough when we try and launch polypropylene, polytetrafluoroethylene and the new ones that are bound to come along, on the public market. Let the p.r.o's. use a bit of " nous," if they have any, and try compiling a few honest-to-goodness and honest-to-business trade marks. Finally, let us beware of pseudo-scientific-business propaganda; if the scientists get mixed up in this then it's woe to the scientist and to the science of polymers.

I have got the polly-wobbles

DOGSBODDY.



Hannover 1958

The West German plastics industry launched an impressive range of new fabricating machinery at this year's Hannover Trade Fair. This special report includes specifications, photos, and comment on this important exhibition.

WEST GERMAN Plastics machinery manufacturers, with the Dusseldorf Plastics Exhibition 18 months away (November, 1959), made this year's Hannover Trade Fair the launching platform for an impressive range of new machinery. They included injection machines, extruders, vacuum formers and H.F. welding units.

Hannover 1958 therefore assumes considerable significance in the plastics world. The report which follows is a detailed analysis of the new equipment on display, presented against a background of established machinery. Viewed in this way, the impact of Hannover is clearly seen: the tentative experiments on the Continent with screw injection machines are finished, for the technique has been proved, and the conventional plunger unit is now confronted with acute competition. Whilst screw preplasticizing as such is not new to Great Britain (*vide* the Windsor range), it was not, until last month, any more than a specialized development of the injection technique. Now we have Eckert and Ziegler, Albert Stübbe and Ankerwerk in the field, with impressive performance data to quote.

HANNOVER FACTS AND FIGURES

Covered floor space (permanent buildings)—2,906,000 sq. ft.
Outdoor exhibits covered 1,615,000 sq. ft.
Number of companies taking space—4,300.
Overseas companies participating—606.
Number of countries represented—20.
Roadways—6¼ miles of full-size surfaced roads.
Communications—helicopters, trams and trains direct to fair grounds.
Electricity—power supply to fair ground equals that required by Leicester.
Labour—20,000 workmen prepared the buildings and site and 40,000 were involved in moving in the exhibits (total weight 28,000 tons).
Food—four international class restaurants, 20 large restaurants, many bars and snack counters. Three thousand waiters, cooks, etc., employed in the fair grounds.

Activity is also intense in the extrusion field. Newcomers to this branch of the industry are Battenfeld; this thrusting company, claiming over 50% of the sales of all injection plant in West Germany, has now turned its attention to the design and construction of extruders. Whatever may be the result, there will certainly be some very keen competition in the immediate future, in a field where competition is already intense. Other highly important extruder developments include the Paul Troester turntable extruder-injection unit, the Alpine "autogeneous" machines and the Johann Fischer bottle-blowing plant.

Vacuum forming is making considerable inroads into the West German injection moulding market. In addition to the Hydro-Chemie range on display, Vogt and Hartmann have launched a new giant and Reifenhauser have come into the field for the first time with a vacuum former specially designed for meeting the demand in the packaging business.

Finally, high-frequency welding, as exemplified by Alfred Schwalbach and Paul Kiefel, has made another important step forward. Their major items, with many other pieces of plant, are reported in greater detail in the following pages.

West German chemical companies were grouped together in Hall 6. This exhibit could not be said to be truly representative for whilst many plastics materials manufacturers were showing, some of the most important were not. Hall 6 was significant because it contained so many examples of finished goods that indicated the way West Germany is absorbing plastics in the domestic and technical spheres. The exhibit of Aachen Gerresheimer Textilglas G.m.b.H., for example, comprising numerous pre-mix polyester glass mouldings, showed that West Germany has made great progress in the use of this material.

Of the Hannover Trade Fair as a whole, little comment is needed. This fabulous West German Exhibition has succeeded magnificently where the British Industries Fair failed. The political, economic and social considerations involved in making Hannover such an outstanding success are beyond comment here, except to say that a city smaller than Coventry can, if all concerned strain every nerve, absorb hundreds of thousands of people for some 14 days, house them, feed them, and enrich the coffers of German industry in so doing. The statistics of Hannover, in the panel opposite, speak for themselves.

Air view of the Hannover Fair. Car parks for over 100,000 vehicles encircle the site. Train, tram and air services operate into the exhibition grounds.

Hannover 1958

THE keynote of the Hannover Fair, in the machinery section, was the radical change to screw preplasticizing for injection machines which, in other countries, is at the moment only a trend. The development is not altogether unexpected in view of the work of Kessler and others on the microscopic examination of nylon mouldings and extrudates. In terms of quality the screw principle inherent in extrusion is substantially superior; by linking this procedure with the injection moulding machine an entirely logical step has been taken which, in addition, provides the moulder with equipment of greater output in terms of both cycling and weight. The screw preplasticizing machine is obviously here to stay and specially interesting is the collaboration between Eckert and Ziegler and Reifenhauser, the one with years of experience in injection moulding machines, the other in the front rank of extruder builders, to produce the new Eckert and Ziegler Duomat. The logical development of this new phase in injection moulding will be specialization of screw profiles for individual materials, coming close at last to the finite control of injection conditions.

INJECTION MACHINES

One of the major features seen at Hannover was the new range of injection machines manufactured by **Eckert and Ziegler G.m.b.H.** (Photograph see Fig. 7). These machines can be equipped with a conventional plunger unit or with a screw unit, and the two can be interchanged with simplicity. The screw machine, which follows the general pattern towards this type of mechanism, has been developed in conjunction with Reifenhauser who have been responsible for the design of the screw. All of the new range of machines are of similar construction having the same mould closing systems and a stationary nozzle platen.

The screw unit is driven by an infinitely variable hydraulic motor mounted on the screw housing. A stepless control of the revolutions per minute makes it possible to equalize the filling time of the screw cylinder and the curing time of the moulded item. Four separate types of screws are available for processing various raw materials.

The new range of machines, carrying the identifying name Duomat, are self-contained fully-automatic units and the control of hydraulic pressure mould closing is independant from the hydraulic mechanism controlling injection. The screw cylinder has four heating zones. Typical specifications for two of the machines are given in Tables 1 and 2, dealing with the Duomat 1200 S, having a maximum injection capacity of 100 cu. in., and the Duomat 500 S, having a maximum capacity of 42.7 cu in.

Albert Stübbe, long well-known as manufacturers of injection moulding equipment, displayed a range of machines including Model H.25 (Fig. 5) designed to be used horizontally or vertically. This model is available in three types, the first a hand lever operated machine for connection to a separately operated hydraulic system, or push-button controlled for connection to an oil-operated hydraulic system, the second a fully-automatic, semi-automatic and manually operated machine for connection to a separate water-operated hydraulic system or push-button control for connection to an oil-operated hydraulic system, and the third machine a fully-automatic, semi-automatic and push-button controlled unit with built-in Vickers' hydraulic equipment. The last mentioned machine is fitted with a piston accumulator operating at 150 atmospheres. The mould closing mechanism although simply constructed is extremely efficient.

The material feed is from an aluminium feed hopper to a metering device which can be regulated with great accuracy by means of a threaded spindle. This device is coupled directly with the plunger guaranteeing the admission of the exact quantity of material required for each working cycle. A specification of the machine is given in Table 3.

Another important development by Stübbe is the H.250 Model employing a single screw instead of a plunger. This machine has been developed primarily to deal with materials which are handled only with difficulty on a conventional machine. Advantages of the new machine include lower specific pressures, increase in plasticizing capacity, operation at lower temperatures,

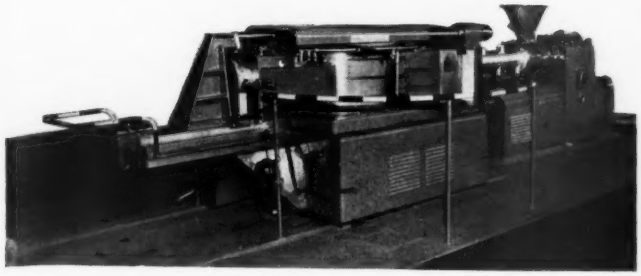
TABLE 1. SPECIFICATION FOR DUOMAT 1200 S

	Screw 70 Ø	Screw 80 Ø	Screw 90 Ø
INJECTION END (SCREW UNIT)—			
Injection capacity (cylinder volume under pressure)... cu. in.	61	79,3	100
App. plasticizing capacity p/h—medium value ... lb./h.	108	141	178,6
Diameter of screw ... ... in.	2 3/4	3 5/8	3 15/16
Section of screw ... ... sq. in.	6	7,75	9,8
Stroke of screw ... ... in.	10 15/16	10 15/16	10 15/16
Range of r.p.m. of screw ... r.p.m.	10–90	10–90	10–90
Specific injection pressure to be controlled up to max. lb./sq. in.	19.600/21.300	14.900/17.000	12.000/13.500
Total force on screw max. t.	53/60	53/60	53/60
MOULD CLOSING END—			
Number of tie bars ...	4	4	4
Diameter of tie bars ... in.	5 3/16	5 3/16	5 3/16
Free space between tie bars in.	31 1/2 x 27 1/16	31 1/2 x 27 1/16	31 1/2 x 27 1/16
Size of mould plates ... in.	47 1/2 x 43 1/16	47 1/2 x 43 1/16	47 1/2 x 43 1/16
Maximum mould opening stroke ... ... in.	25 1/8	25 1/8	25 1/8
Maximum mould height ... in.	17 7/8	17 7/8	17 7/8
Minimum mould height ... in.	15 13/16	15 13/16	15 13/16
Maximum mould closing force ... ... t.	500	500	500
HYDRAULIC EQUIPMENT (SYSTEM VICKERS)—			
Two oil pumps, operating pressure each ... ... lb./sq. in.	1000/1140	1000/1140	1000/1140
Capacity of oil motor for drive of screw ... ... PS	28,5	28,5	28,5
Capacity of oil tank ... gallons	240	240	240

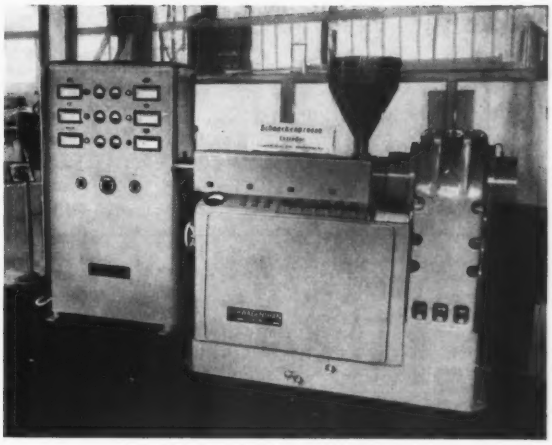
TABLE 2. SPECIFICATION FOR DUOMAT 500 S

	Screw 50 Ø	Screw 60 Ø	Screw 70 Ø
INJECTION END (SCREW UNIT)—			
Injection capacity (cylinder volume under pressure)... cu. in.	21,3	30,5	42,7
App. plasticizing capacity p/h—medium value ... lb./h.	55,1	79,5	108
Diameter of screw ... ... in.	1 15/16	2 3/16	2 3/8
Section of screw ... ... sq. in.	3,1	4,4	6
Stroke of screw ... ... in.	7 1/16	7 1/16	7 1/16
Range of r.p.m. of screw ... r.p.m.	10–70 or 15–105	10–70 or 15–105	10–70 or 15–105
Specific injection pressure... lb./sq. in.	24–800	17.700	12.800
Total force on screw ... max. t.	35	35	35
MOULD CLOSING END—			
Number of tie bars ...	4	4	4
Diameter of tie bars ... in.	5	5	5
Free space between tie bars in.	19 1/16 x 23 5/8	19 1/16 x 23 5/8	19 1/16 x 23 5/8
Size of mould plates ... in.	31 1/2 x 37 13/16	31 1/2 x 37 13/16	31 1/2 x 37 13/16
Maximum mould opening stroke ... ... in.	21 3/16	21 3/16	21 3/16
Maximum mould height ... in.	17 7/8	17 7/8	17 7/8
Minimum mould height ... in.	15 13/16	15 13/16	15 13/16
Maximum mould closing force ... ... t.	350	350	350
HYDRAULIC EQUIPMENT (VICKERS SYSTEM)—			
Two oil pumps, operating pressure each ... ... lb./sq. in.	1000	1000	1000
Capacity of oil motor for drive of screw ... ... PS	20	20	20
Capacity of oil tank ... gallons	175	175	175

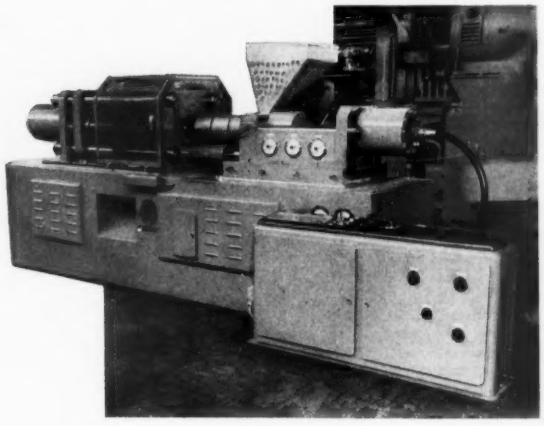
(Below) Fig. 1. The Troester Extr-A-Formatic moulding machine.



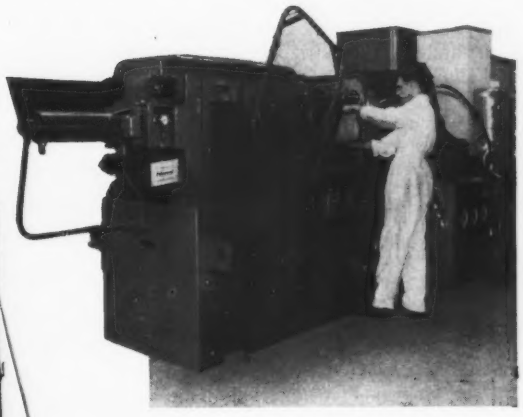
Hannover 1958



(Above) Fig. 2. Ruth Schwabenthan extruder.



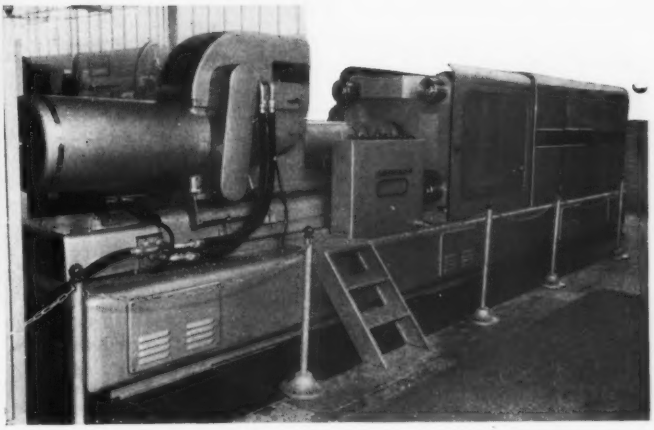
(Above) Fig. 3. Latest injection machine shown by P. Flesch.



(Above) Fig. 4. The 1044 injection machine shown by R. H. Windsor Ltd.

(Left) Fig. 5. The Albert Stübbe vertical injection machine.

(Below) Fig. 6. The new S.60 Reifenhauser extruder.



(Right) Fig. 7. Eckert and Ziegler's new screw pre-plasticizing injection machine.

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higher output of better quality mouldings, greater dimensional accuracy of the moulded articles, improved dry colouring and acceleration of the process of changing colour.

TABLE 3. SPECIFICATION FOR STUBBE MODEL H25

Maximum projected area of moulding	18,5 sq. in.
Plasticizing capacity	19–16,5 lb. p/h.
Closing pressure	59 tons
Number of shots per minute	Up to 15
Speed of injection piston adjustable smoothly from slow to very fast	
Piston stroke	4 in.
Heating element rating	0.9 + 0.7 + 0.2 1,8 kW.
Volume of pressure fluid/cycle at 2830 p.s.i. operating pressure with constant counter-pressure	½ imp. gall.
Clearance between bars	11⅞ in.
Minimum mould height	4½ in.
Maximum mould height	8½ in.
Maximum mould opening	8½ in.
Clamping hydraulically-operated toggle lever	

The basic construction of the machine is that of the H.200 series and all of the attractive features of this series are retained including the high mould clamping pressure. The point of difference is in the injection unit. A specification for this new Stübbe machine is given in Table 4.

TABLE 4. SPECIFICATION FOR STUBBE MODEL H250

Maximum projected area of moulding	93 sq. in.
Plasticizing capacity	48–76 lb. p/h.
Closing pressure	245 tons
Number of shots per minute	Up to 6*
Injection-stroke infinitely variable	0–5⅞ in.
Heating element rating	1,25 + 1,25 + 1,25 + 1,25 + 1,25 + 1,25 + 0,2 kW.
Volume of pressure fluid/cycle (when connected to separate hydraulic plant)	¾–1½ imp. gall.
Clearance between bars :	
Horizontal	13¾ in.
Vertical	7⅛ in.
Minimum mould height	8⅜ in.
Maximum mould height	14⅞ in.
Maximum mould opening	12⅜ in.
Diameter of screw	2.36 in.
Speed range of screw	From 25 to 125 r.p.m.
Clamping : hydraulically-operated toggle lever	
VICKERS HYDRAULIC—	
Oil-motor to drive the screw	10 h.p.
Volume of oil-tank	77 gall. (350 litres)

* The shots per minute depend from the various materials at request.
Max. volume of injection: 21.4 cu. in.
The shapes of the screw can be adapted to the various materials.
The spec. injection-pressure can be regulated smoothly up to maximum 17.920 lb./sq. in.

R. H. Windsor & Co., Ltd., stated at the close of the exhibition that they had received orders for over £500,000 worth of machinery. Prominent on their stand was the now well-known SH3 fully-automatic machine equipped with the multi-pack and injection pressure reducing device. The mechanism is specially designed to exert an evenly distributed pressure up to 65 tons and the multi-pack principle has been incorporated to effect increased shot weight capacity. The reduced pressure device provides for relief of cavity pressure as an aid to strain free moulding. A specification for the SH3 machine is shown in Table 5.

Also of great interest was the 1044 Autoplas, Fig. 4, a single stage multi-screw in-line preplasticizer machine. This machine was a pioneer of the modern concept of screw preplasticizing systems and as a comparison with other machines quoted in this report a specification is given in Table 6.

TABLE 5. SPECIFICATION FOR WINDSOR SH3

*Capacity moulded per shot (polystyrene)	3 oz.
*Plasticizing capacity per hour	20/22 lb.
Diameter of injection plunger	1 11/16 in.
Area of injection plunger	2.24 sq. in.
Total load on injection plunger	33,200 lb.
Pressure on material	14,900 p.s.i.
Stroke of injection plunger	5⅞ in.
Maximum number of shots per hour (dry run)	360
Space between tie bars	12½ in.
Height of mould plate	9⅞ in.
Mould opens	9 in.
Maximum mould thickness	9½ in.
Minimum mould thickness	4½ in.
*Maximum area moulded	18/25 sq. in.
Mould closing pressure	65 tons
Capacity of hopper	25 lb.
Heating unit consumption	2.5 kW.
Type of pump used	V.135. US 7
Capacity of pump (at maximum pressure)	13.6 gall./min.
H.P. of motor at 960 r.p.m.	8½

* Dependent on material and mould construction.

TABLE 6. SPECIFICATION FOR WINDSOR 1044

* Capacity moulded per shot of 44 cu. in., i.e. 32 oz. C.A. 26 oz. polystyrene.	
*Plasticizing capacity per hour	120–140 lb.
Maximum pressure on material	10,000 p.s.i.
*Maximum area moulded	160 sq. in.
Maximum heating unit consumption	7½ kW.
Actual injection time	2 seconds
Locking pressure	300 tons
Type of locking mechanism	Multi-leaved toggle
Distance between tie bars—vertical	14½ in.
Distance between tie bars—horizontal	14½ in.
Diameter of tie bars	3½ in.
Mould opens	12 in.
Mould adjustment	9 in.
Maximum mould thickness	17 in.
Minimum mould thickness	8 in.
Size of mould plates	29½ in. x 25 in.
Mould area between tie bars—horizontal	29½ in. x 14¾ in.
Mould area between tie bars—vertical	25 in. x 14¾ in.
Capacity of hopper	90 lb.
Type of pump used	V.S.G.3/2000
H.P. of motor	25

* Dependent on material and mould construction.

Paul Troester Maschinenfabrik showed one of the sensations of the exhibition, the Extr-A-Formatic, a combination of an extruder and injection machine, employing a revolving table carrying the dies, as seen in Fig. 1. This machine is possible one of the most versatile ever to be developed for plastics moulding, permitting the production of components of widely different volumes and wall thicknesses. The equipment is specially valuable for use with heavy sections which, whilst using fully the immense plasticizing capacity of the machine, also benefit from the extending cooling cycle inherent in this type of plant.

The mechanism comprises essentially an extruder linked with the moulding mechanism, a revolving table with vertical axis carrying the dies. Both the extruder and the moulding unit are controlled automatically from one switch cabinet which is equipped with time-limit and temperature relays. The well-known Troester extruders type EP90 and EP120 are employed; with the former a moulding throughput of 264 lb. is possibly and with the latter 550 lb. per hour. The revolving table is capable of accepting up to 24 separate moulds and articles from 3 oz. to 105 oz. can be economically manufactured. Advantages, in addition to the substantial productive capacity, include the production of homogeneous mouldings free from stress, much lower closing pressures and larger projected mould areas. It is possible, with this plant, to mould in cycles of varying length

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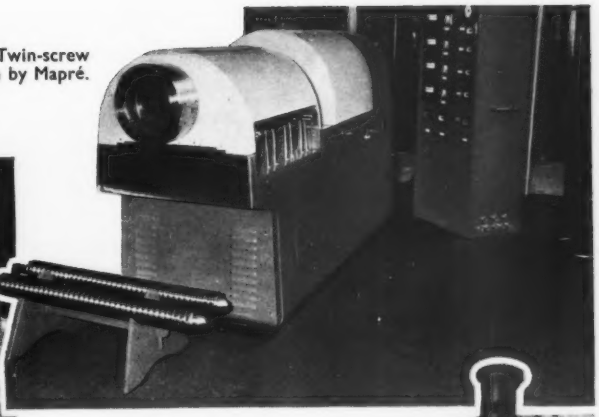
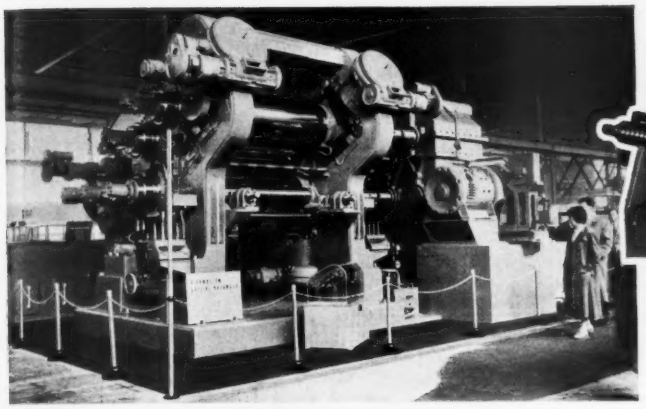
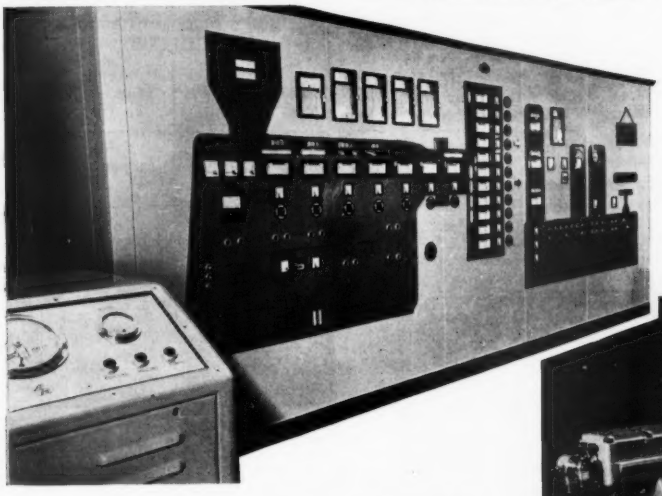
(Right) Fig. 9. Twin-screw extruder shown by Mapré.





(Left) Fig. 8. Four-bowl calender of Herman Berstorff.

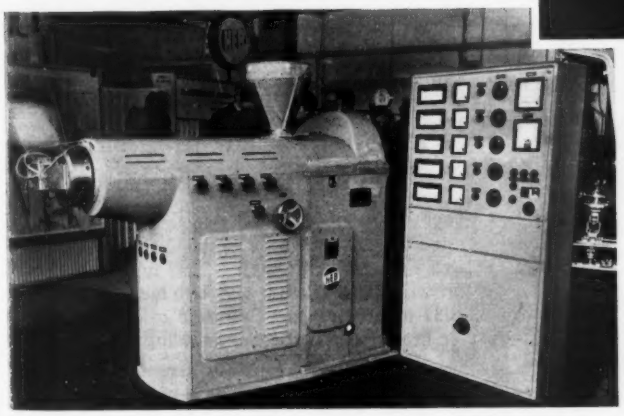


(Right) Fig. 11. Internal mixer by Werner & Pfleiderer.

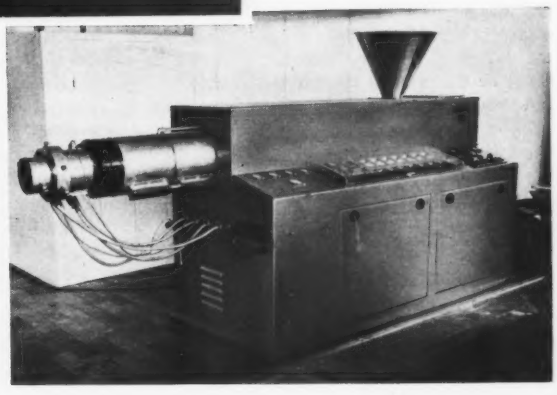
(Left) Fig. 12. Berstorff K.45 extruder and control panel.

(Above) Fig. 10. Control panel for continuous sheet extrusion plant designed and built entirely by Reifenhauser for Rheinische Gummi und Celluloid Fabrik.

(Below) Fig. 13. 3-in. extruder by Harburger Eisen und Bronzewerke.



(Below) Fig. 14. The new Battenfeld extruder.



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components of different weights and shapes and at the same time to have automatic opening of the moulds.

The extruder is connected to the moulding table by means of four stay bolts, easily removed for cleaning the extruder or changing screw.

Electro magnetic control valves as well as the gear brake motor are operated by limit switches which are automatically controlled by adjustable cams. The arrangement and adjustment of these cams depends on the number and position of the moulds so that each of the moulds controls its working programme automatically. Finally, the injection of the material is via a positive locking system.

The Extr-A-Formatic will obviously give rise to considerable discussion in the moulding industry throughout the world and would appear immediately to offer a solution to numerous problem mouldings where massive sections make their production difficult by conventional equipment. At the same time, full use of the machine's potential necessitates a number of mouldings all suitable for one grade and one colour of one material except in the case where one product only is being made from a multiplicity of dies.

A range of injection machines manufactured by **P. Flesch,** ranging in capacity from 2 oz. to 26 oz. (based on polystyrene shot), was on view. The plasticizing capacity of these machines range from 17½ lb. to 83½ lb. The machines are also manufactured in both vertical and horizontal types and a feature is that they incorporate accumulator pressure vessels designed to provide faster rates of closing and injection. (Photograph see Fig. 3.)

Ankerwerk were well represented, and full details of the single screw machine were published in last month's issue (May) of *Plastics*, pages 176-177, complete with "exploded" drawing. Ankerwerk were one of the first companies to adapt the screw principle to injection moulding in West Germany.

The full range of **Battenfeld** machines on display emphasized the important position of this company in the injection machinery field. Several novel items were shown including a unit for automatically printing moulded items as they are produced.

The major question at the moment is whether Battenfeld will follow the movement to screw preplasticizing or continue the development of new machinery of the plunger type.

EXTRUDERS

The design of the now well-known **Reifenhauser KG.** S45 extruder has recently been revised to yield the new model type S60 (Fig. 6) which, in a sense, is the logical development of the many years' experience gained in the production of extruders by this company.

Having a common machine frame, constructed robustly in cast iron, the majority of the important working parts are interchangeable. By this method of construction it is possible to exchange the driving units to select the best kind of transmission for any particular processing. A feature of interest is that in place of the cooling system which was an integral part of the outer cylinder wall, cooling is now effected by external spiral cooling pipes. Problems of furring-up, etc., which would have necessitated direct access to the barrel itself can now be dealt with in a more efficient and simple manner. The screw cylinder is easily accessible owing to the hinged alloy housing. Technical details of the new machine are as follows: screw length 20 or 25 diameters, screw diameter being 2.3 in. Screw speeds are from 4 to 101 r.p.m. and in certain cases higher.

Frieseke & Hoepfner G.m.b.H. displayed a number of machines. This company is well-known for its robust constructions and for the wide range of ancillary equipment available including cooling baths, roll up units, cutting machines and calibrating equipment.

One of the interesting units shown by **Harburger Eisen und Bronzewerke A.G.** was a 3 in. extruder. The manufacturers of this equipment specialize in high-duty machines capable of handling a wide range of materials (Fig. 13). The company also produce twin screw machines which have been found to have considerable application in the cable industry and also for use as compounders in place of roll mills.

Johann Fischer displayed, amongst other equipment, an extruder for bottle blowing. The machine was seen at Amsterdam in November, 1957, with a single mould. At Hannover, a triple mould unit was on display, providing obviously for higher output. Unfortunately it was not possible to photograph this new unit. Specifications of the extruders made by the company are, however, available and are given below.

FISCHER EXTRUDERS—SPECIFICATIONS

Type	JFP 32	JFP 50	JFP 60	JFP 90
Screw diameter ... ... in.	1½	2	2½	3½
Drive power ... ... h.p.	3	7,5	10	20/27
Effective screw length ...	15 D	15 D	15 D	15 D
Screw speed range ... ... r.p.m.	25–110	18–81	16–72	17–76 16–61
Gearing	PIV Speed variator			
Discharge rate (dependent on material and cross section) ... ... about lb./hr.	22–33	33–66	55–88	110–220
Extruding height ... ... in.	40	40	41	43–49
Heating capacity extruding cylinder ... ... W.	2000–2700	2400–3600	2600–3900	9900–10000
Heating capacity standard longitudinal extruder head W.	900–1400	1200–1800	1300–1800	2600– 4000
Heating capacity standard inclined extruder head ... W.	1200–2000	1200–2000	1300–2200	2600– 5000
Heating capacity standard vertical extruder head ... W.	1200–1800	1200–2000	1300–2200	2600– 5000
Temperature control and regulation...	gravity-type regulator with impulse contact			
Measuring range ... ... ° C.	50– 300 50– 400	50– 300 50– 400	50– 300 50– 400	50– 300 50– 400

Battenfeld have been well known for a long period in the injection machine field. They have been the biggest manufacturers of injection machines in Germany for several years and it is therefore interesting to note their entry into the extruder manufacturing field (Fig. 14). The Battenfeld extruders are made with screw L/D ratios ranging from 15 to 25 and the speeds of screws range from 10 to 75 r.p.m. for the ¾ in. machine to 6 to 38 r.p.m. for the 7 in. machine. On the smallest machine two heating zones are provided for the barrel, there being five zones on the biggest machine.

The machines are of the single screw type and the company also manufactures dies, take-off gear and other ancillary equipment. The entry of this company into the extruder field will obviously provide a strong competitive element in the future.

Ruth Schwabenthan Maschinenfabrik displayed representative equipment from a range of extruders. These machines are designed as general purpose equipment for profiles, sheets, foils and cable coverings and are manufactured with screw diameters of from 1¾ to 3 in. (see Fig. 2).

In the twin screw extruder range, **Mapré S.A.,** the Luxembourg company showed the E25492 machine. This unit is equipped with Siemens drive motor of 13.6 h.p. and with the P.I.V. speed is variable from 257 to 1155 r.p.m. Extrusion cylinder length is 31 in. with three heating zones and three cooling zones (Fig. 9).

Great interest has been expressed in recent years in the so-called "autogenous" extruder, that is a machine operating at high speeds, heating being carried out by friction with the

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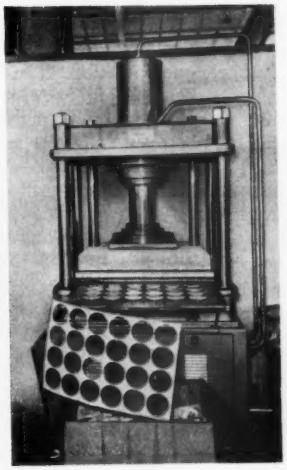
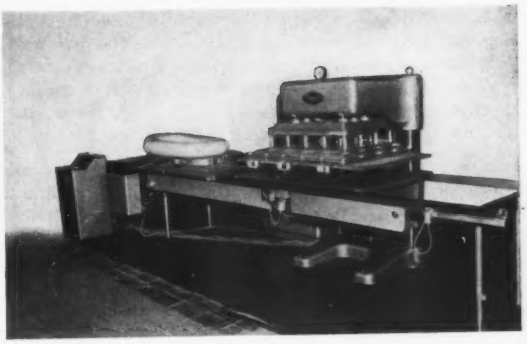
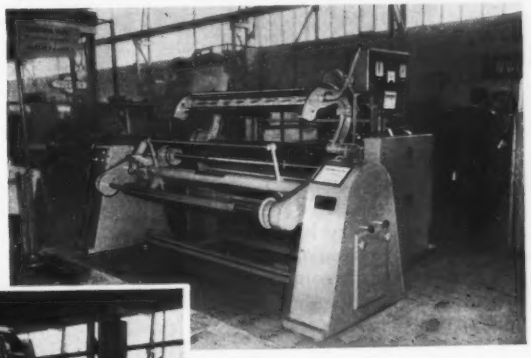
(Above) Fig. 15. The Hydrochemie Formvac in action.



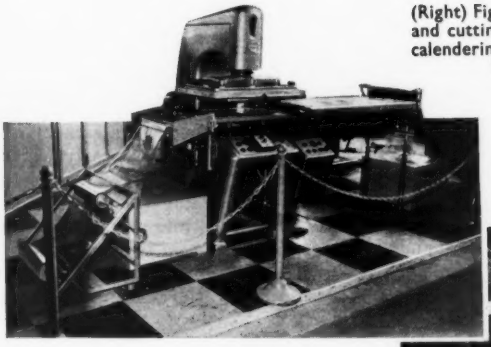
(Above) Fig. 16. The Triplastic cutting unit for vacuum formed products, shown by Schwalbach.



(Above) Fig. 17. Schwalbach's large H.F. welding unit.



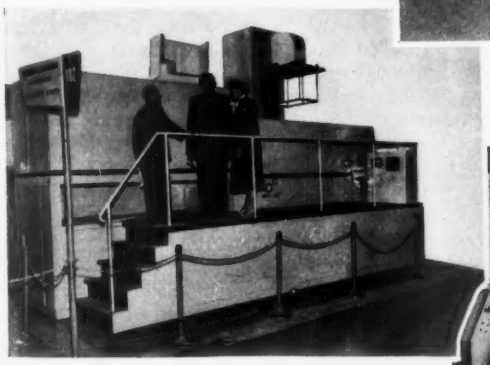
(Right) Fig. 19. Reeling-up and cutting mechanism for calendering, by Stahlkontor Weser.



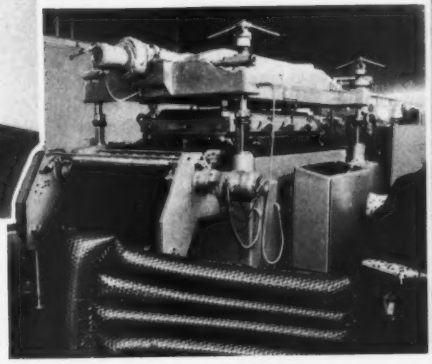
(Above) Fig. 18. H.F. welding unit shown by Korting Werk.

(Left) Fig. 20. Inspection and re-reeling unit for sheeting, shown by Stahlkontor Weser.

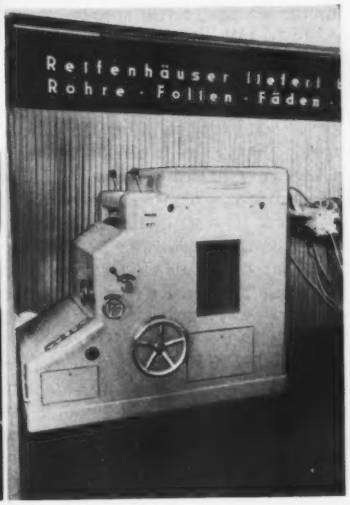
(Below) Fig. 21. The new Plastiplast vacuum forming machine.



(Right) Fig. 23. The new Reifenhauser vacuum forming machine.



(Right) Fig. 22. Continuous welding of beach mattresses on the Paul Kiefel machine.



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establishment of a heat balance which gives accurate control of temperature. Exponents of this particular system are **Alpine Aktiengesellschaft.** Leading the technical research centre at the Alpine works has been Dr. Erich Beck, who has published a number of papers on the technique and whose researches have resulted in the range of Alpine machines. The smallest unit has a screw diameter of 0.34 in. with a 0.5 h.p. motor, the largest a screw diameter of 2½ in. with a h.p. of 36.

The driving action of the screw provides, by friction, the heating of the thermoplastic mass. Regulation of the machine is by means of a measuring device which controls the energy up-take from the driving motor. The process achieves a throughput of from two to three times higher than with slow speed extruders of equal screw diameters plus higher thermal efficiency. Higher extruding temperatures can also be employed since the material is actually in the barrel for a much shorter period than is the case with a slower moving machine. Amongst the materials successfully handled with this equipment are p.v.c., high and low pressure polythene, high impact polystyrene, cellulose acetate, polymethyl methacrylate and nylon.

The high speed operation of this range of machinery, coupled with the self-regulation conferred by the heat balance achieved, makes them of great interest in many fields of application. It will be surprising if development work in this centre is not pressed further still, since the Alpine machines provide more than adequate proof of Dr. Beck's investigations.

Werner and Pfleiderer showed the twin screw machine type ZSK83/700 which has been designed for compounding, calender feeding and for extruding. Following the lengthy experience of this company in the compounding field, this extruder naturally provides outstanding homogeneity in the material worked. Intensive mixing and kneading action is conferred by the stepped screw construction of the two screws. Careful design has also reduced the possibility of compound degradation and provides extremely high throughput. 352 lb. per hour of high density polythene or hard p.v.c. can be handled, whilst for plasticized p.v.c. the figure rises to 528 lb. per hour. The manufacturers claim for this machine a unique range of applications, and maximum reliability in operation. It has been found to meet the most critical needs in terms of high quality mixing whilst it is so robustly constructed that it will also produce to very high production rates. Technical details of the machine are as follows, screw diameter 3½ in., effective length of screw 27½ in., motor 40 h.p., screw speeds 25 to 100 r.p.m., heating output 12 to 16 kW.

Hermann Berstorff Maschinenbau-Anstalt G.m.b.H. exhibited a number of machines including the K150,25D, an extruder developed specifically for the processing of low pressure polythene, polymethyl methacrylate and polystyrene. The length diameter ratio of the screw is 25 : 1, with 5.8 in. diameter and a vacuum zone is provided in the barrel for the extraction of volatiles. The unusually long screw in relation to diameter has been found to give vastly improved performance in comparison with the conventional single screw extruder having a shorter L/D ratio. The drive from the motor is via an infinitely variable Schaerer-Bayer gearbox. The machine can be equipped with a special die for pipe manufacture having a cooling mandrel for the internal calibration designed for use with thin wall tubes. Also shown was the G120 Model having a L/D ratio of 6 : 1 with a screw diameter of 4¾ in. This machine has been specially developed for extruding profiles and hose and for sheathing cables and wires with specially tough rubber and synthetics. Also shown was the K90 twin screw extruder, designed as a general purpose machine for all types of plastics materials.

CALENDERS

One of the show pieces in the machinery hall was the four-bowl Berstorff calender developed for coating both sides of fabric in one operation. The roll arrangement is of the Z type, the rolls being 26½ in. × 70¼ in. in dimensions. Operating speeds are from 13 ft. to 135 ft. per minute, friction calendering being possible between rolls one and two and between rolls three and four. Drive is by 210 volt D.C. Ward Leonard motor with a special gearbox having four flexible clutches for direct connection between gear pins and rolls. Rolls one and four are equipped each with a pivoting arrangement to take up any bending through the rolls. In addition, hydraulic pressure can be operated against roll three for pressing the fabric reinforcement against the bottom platen. The calender as exhibited was beautifully finished (see Fig. 8) and was an outstanding tribute to the craftsmanship of the Berstorff organization.

Stahlkontor Weser G.m.b.H. had several interesting items to show, designed for use with calendering plant. The first (Fig. 20) was a re-reeling device coupled with an illuminated inspection panel for handling p.v.c. sheet. The second was an automatic reeling and cutting machine (Fig. 19), again for use with p.v.c. sheet.

Mixing Equipment

Amongst the items of big plant was the heavy-duty international mixer manufactured by **Werner and Pfleiderer.** This machine (see Fig. 11) has been specially developed for handling synthetic materials and reflects the continuing research by the Werner and Pfleiderer organization into problems of compounding and mixing.

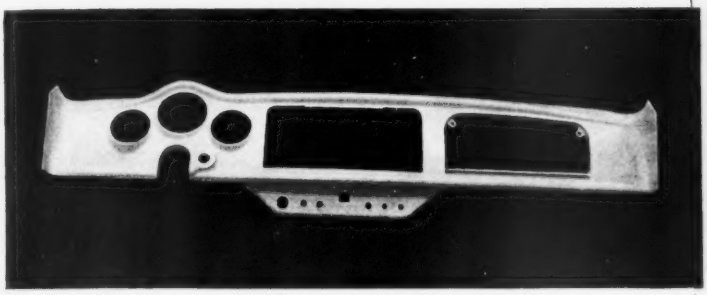
VACUUM FORMING

The latest in the series of Formvac machines, manufactured by **Hydro-Chemie,** was shown (Fig. 15), the U5 carrying out four forming processes, deep draw, drape, airslip and drop form. The maximum depth of draw of this machine is 24 in. Deep draw is a process of drawing sheet into a female mould. Drape forming and airslip forming, the one a refinement of the other, are techniques designed to reduce or eliminate thinning of the sheet during forming whilst the drop forming technique permits more complex mouldings still to be produced. The principle is to heat the sheet and then to drive a plug downwards at high speed to preform the sheet into a female mould. The plug can be centred over any desired portion of the table or multiple plugs can be fitted. Hydro-Chemie have carried the vacuum forming process from the rudimentary stage in which it existed for many years to a high speed fully-automatic technique now ranking as a major manufacturing aid.

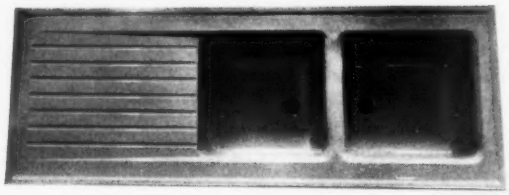
Competing in this field are **Vogt & Hartmann,** who showed the new Plastiplast 58 MA machine (Fig. 21) with a platen area of 78¾ in. × 39¼ in. This machine, trade marked the Contraform, is electrically controlled for drape and vacuum forming and is designed for continuous operation. The machine is fitted with an infra-red heating oven and electrically controlled forming cycles. The output of this machine is enormous and provides for positive draping with die elevation and plug-assist for double-wall formings. The depth of draw on the machine is 19 in. This outstanding advance in the vacuum forming field created great interest amongst visitors to Hannover.

Another newcomer to the vacuum forming field is **Reifenhauser K.G.** This company has put on to the market the Verformat; designed initially for the automatic production of containers suitable for use as jars, boxes, washers, sealing rings, etc., the unit is ideally united with a Reifenhauser extruder, the hot and plasticized film requiring no further heat treatment prior to forming. The vacuum forming machine automatically accepts the film, seals, forms, stamps, and air ejects. Up to 10,000 mouldings per hour can be produced. Scrap material derived from the cutting operation is passed through a granulator and fed back into the extruder hopper. It would appear that this machine will excite a great deal of

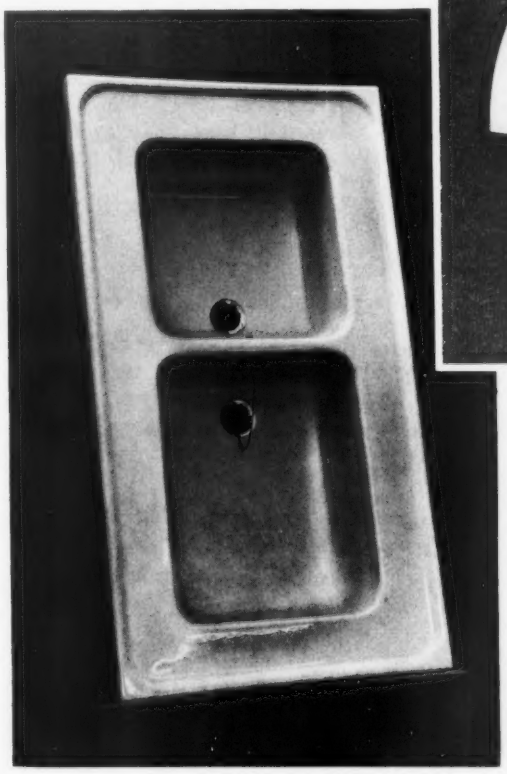
(Below) Fig. 24. Motor car dashboard moulded in Gevetex premix alkyd material.

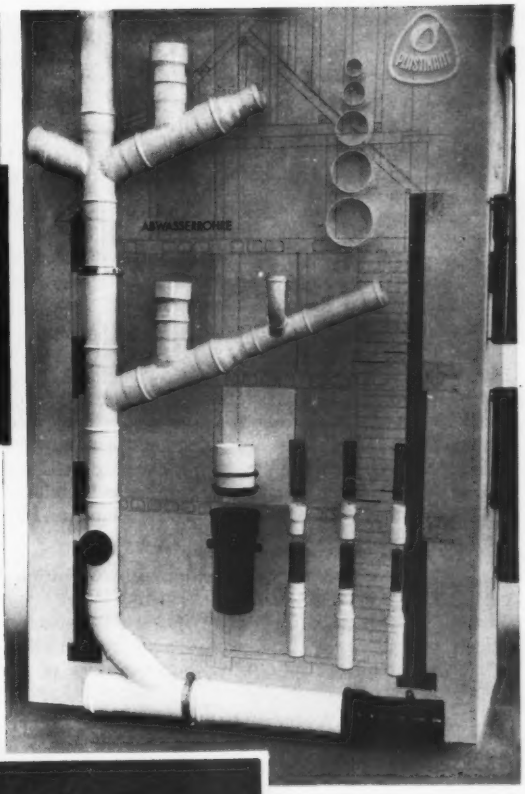


Hannover 1958

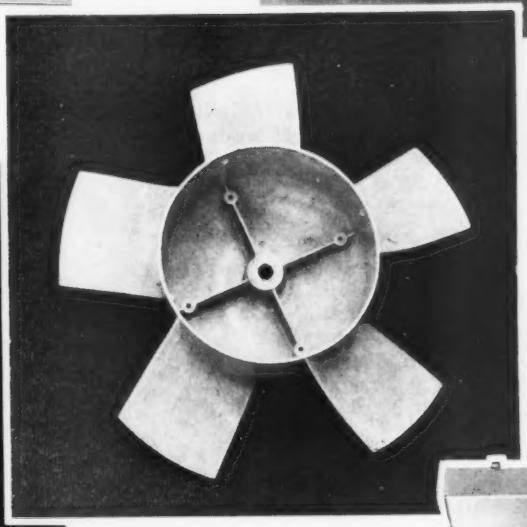


(Above) Fig. 26. Polyester-glass sink unit using Gevetex glass.





(Above) Fig. 25. Rehau Plastiks showed a complete range of p.v.c. extrusions for domestic and industrial piping.



(Left) Fig. 27. Impeller in Gevetex premix.

(Left) Fig. 28. Polyester-glass sink unit shown by H. E. Schniewind.

(Right) Fig. 29. Food container, fully insulated, with casing in polyester-glass. Shown by Schniewind.

Hannover 1958

interest, particularly from the performance point of view. The effective width of material handled is 19.6 in., the working area is 5 sq. ft. and the adjustable cycle speed is 0–24 per min. The unit is shown in Fig. 23.

WELDING

Outstanding in the welding machinery section was the contribution by **Paul Kiefel,** a continuous HF welding machine (Fig. 22) designed for the mass-production of such large items as automobile upholstery, beach mattresses, etc. For air mattresses, embossed p.v.c. sheet is fed continuously in two layers into the machine. The welding cycle takes place after which the now welded sheet is reeled up at the opposite end of the machine. The reels are subsequently removed and are guillotined and require little after-processing before dispatch. The welding cycle for the mattress is 15 seconds and the welding area of this machine is 3 ft. × 6 ft. The machine can be operated automatically.

Alfred Schwalbach showed continuously operating welding machines including automatic bag making plant for the production of polythene bags (Fig. 17). Also shown on the Schwalbach stand was an interesting piece of equipment, the Triplastic machine (Fig. 16) for the separation of mouldings from the sheet subsequent to the vacuum forming process. The Triplastic machine was shown operating on vacuum formed carton caps. This machine will handle up to 100,000 caps a day.

Welding equipment was shown by **Korting** including the motor driven press MP500 for welding areas of up to 19 in. × 33 in. (Fig. 18).

Preheating equipment was displayed by **Herfurth G.m.b.H.** and this company also manufactures high-frequency welding apparatus and other electrical equipment used by the plastics industry.

Brush-Making Equipment

One of the few British exhibitors in Hall 4 was the Portsmouth company, **J. Evans & Son, Ltd.,** who specialize in the manufacture of brush–making machinery. One of the interesting pieces of equipment shown was the Model GS fully-automatic machine filling at the rate of 220 to 250 tufts per minute, and operating at a drill speed of 2,000 r.p.m. An example of its capacity is its ability to produce 20 to 22 gross of completed toothbrushes per eight-hour day.

MATERIALS AND PROCESSES

Materials—Trends

West Germany, of all European countries, has been slowest to adopt plastics for consumer goods. This notwithstanding the fact that next to the U.S.A., W. Germany is the biggest producer of plastics materials.

The explanation lies in the very substantial absorption of plastics materials in industrial and semi-technical applications, usually of very high quality. The typical " hardware " stores window commonly seen in Britain and France, filled to overflowing with household items in polythene and polystyrene, is not yet seen in Germany. Rather is the weight of effort directed to getting plastics used in automobiles (more than in the U.K.), packaging (films, foils, and massive mouldings such as sintered polythene) and as components in high cost consumer goods, such as refrigerators, vacuum cleaners, optical equipment, etc.

Hannover cannot be said to be completely representative of the W. German plastics industry, although it is more so than the B.I.F. ever was. Nevertheless, exhibits at Hannover reflected the basic trends, as will be seen in the following notes. They show clearly the growing interest there in vacuum forming both for mass production of packaging items and for very large mouldings.

Materials—Glass

One of the largest exhibits was staged by **Aachen-Gerresheimer Textilglas G.m.b.H.** This company, using the trade name Gevetex, showed mouldings made by various German companies

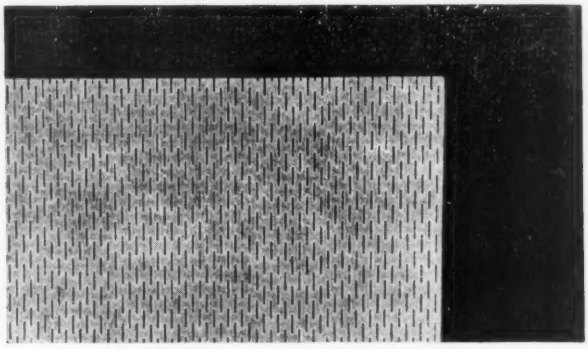


Fig. 30. Mosquito screen shown by Gevetex.

using Gevetex glass reinforcement. One example was a double sink unit, with a beautifully finished surface, employing chopped strand mat and cloth (Fig. 26). Another was an industrial moulding bonded with an epoxy resin, a reinforced groove being built in. A novel use for flat polyester-glass sheet was demonstrated by the mosquito panels for equatorial trains, hotels, etc., where the sheet was perforated by longitudinal slots (Fig. 30).

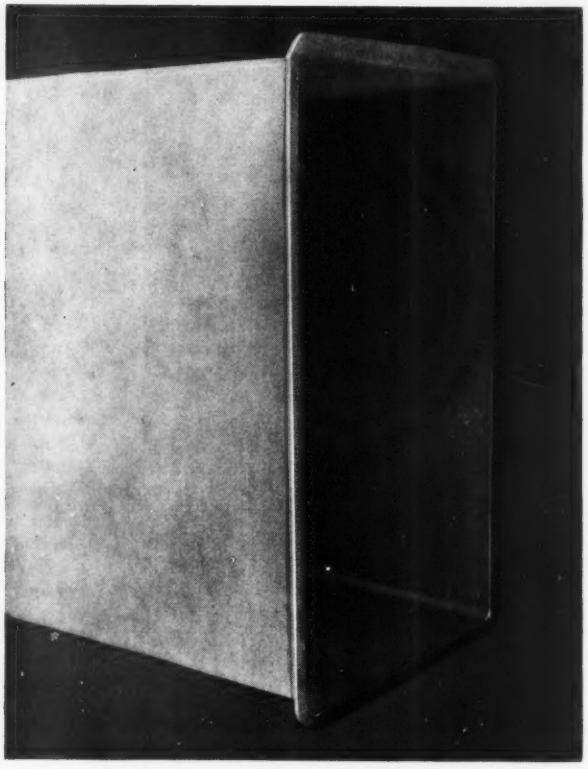
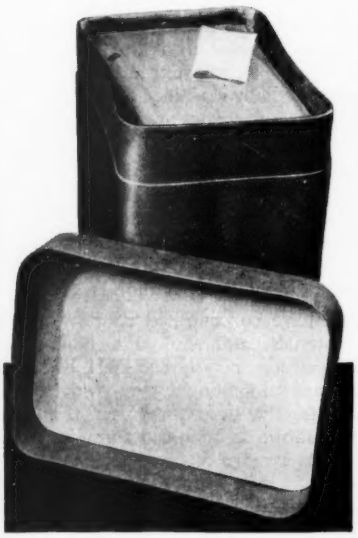
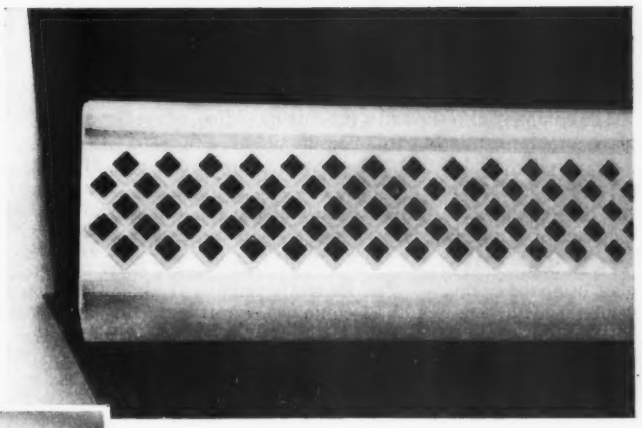


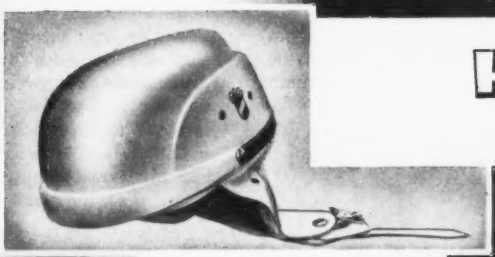
Fig. 31. Vacuum formed refrigerator liner shown by Varta.



(Left) Fig. 32. P.V.C. sheeting in a fibre drum for fluid handling, shown by Varta-Plastic.



(Right) Fig. 33. Extruded and moulded lighting louvre by Deutsche Tafelglas.



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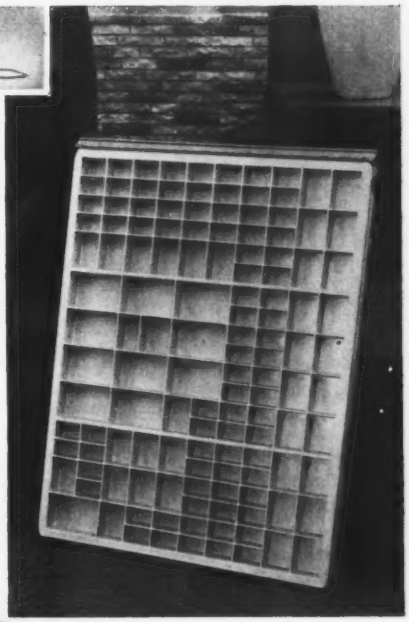
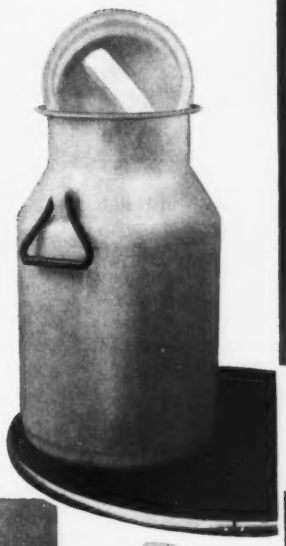
(Right) Fig. 34. Crash helmet using Hagedorn material.

(Above) Fig. 35. High impact polystyrene is used for this self-service store basket (Varta-Plastic).

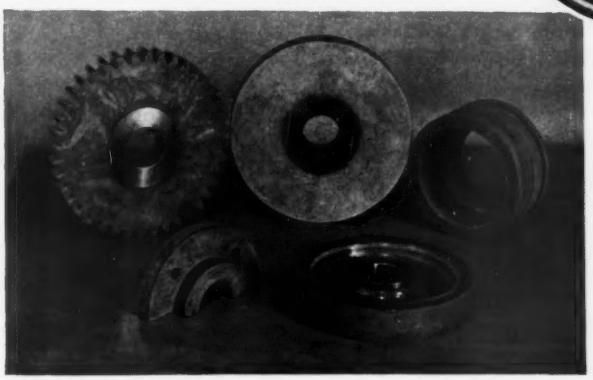


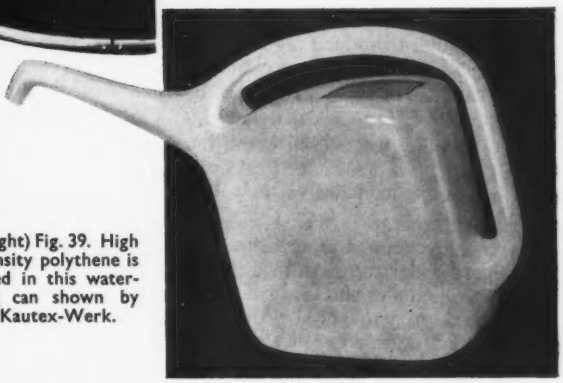
(Right) Fig. 36. Polystyrene work tray shown by Hagedorn.



(Left) Fig. 37. Polythene milk churn exhibited by Varta-Plastic.

(Below) Fig. 38. Nylon-filled melamine mouldings (Stellard).





(Right) Fig. 39. High density polythene is used in this watering can shown by Kautex-Werk.

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The company also showed a pre-mix moulding, using Gevetex glass, a motor-car dashboard. This moulding, 5 ft. wide, carried a heavy glossy finish that was most pleasing to the eye. The pre-mix compound has a pot life of up to six months. Pre-mix was also employed to produce the impeller which had a total diameter of 12 in. (Fig. 27).

H. E. Schniewind also showed a double sink unit in polyester-glass using the company's glass for reinforcement. An important exhibit here also was a food container, for transporting and storing food either hot or cold, the case of which was moulded in polyester-glass (Figs. 28 and 29).

Moulded Goods

Current moulding trends in Germany were discernible from the exhibits in Hall 6. Whilst large mouldings are still made, the tendency is to put the really big moulding on to a vacuum

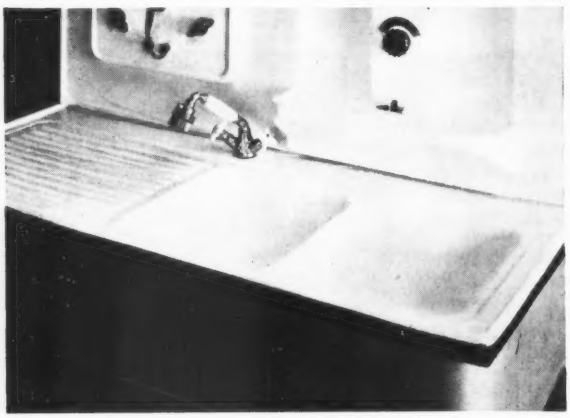

Fig. 40. Sink unit vacuum formed on the Vogt and Hartmann machine.

forming machine where possible. Hence the emphasis in Hall 6 on sheet materials for vacuum forming. However, some examples of injection moulding will be of interest. **Varta-Plastic G.m.b.H.** showed a self-service store basket in high impact polystyrene. When the handle is lifted to the vertical position it slides into a slot holding it there (Fig. 35). **Kautex** showed a watering can, also suitable for industrial use, in high density polythene, of novel design (Fig. 39).

In the vacuum forming field, **Hagedorn & Co.,** manufacturers of sheet material, showed many interesting mouldings made by their customers. One, a work tray, was an outstanding example of the vacuum forming technique. A crash helmet, in high impact polystyrene, was also shown by Hagedorn (Fig. 34).

Blow moulded products were shown by several companies, including **Kautex-Werk,** who specialize in bottles. This company builds its own machines, and also injection moulds all the necessary caps.

P.v.c. sheeting was shown in an interesting application by **Varta-Plastic,** a container for fluid handling inside a fibre case. This inexpensive container is now being widely used for the handling of fluids of all kinds (Fig. 32).

Varta also showed spun sintered polythene containers, including a milk churn. In high density polythene, this churn can be sterilized and offers a tremendous saving in weight. The polythene churn is roughly 1/7 the weight of the metal version. Handling and transport costs are thus much reduced.

Industrial mouldings, including gears, pulley wheels, etc., were shown by **Stellard** to demonstrate the properties of a new Swedish nylon filled melamine moulding material. This compound is claimed to be far superior to normal high-shock thermoset compounds, and may be compared in many respects to the fabric-filled laminates normally machined to give products of this kind. The moulding characteristics are said to be good.

Rehau Plastiks G.m.b.H. have carried the use of p.v.c. in the plumbing field to a very advanced stage. Pipes and fittings are made in five sizes, with coupling units to convert one to another through the range. Although German authorities impose very severe restrictions on plastics in this field, the trend is towards a general acceptance of such plastics as p.v.c. since they have now proved their suitability for the job (Fig. 25).

Deutsche Tafelglas A.G. have concentrated entirely on the manufacture of sheet materials, and showed a number of interesting items. One, an extruded polystyrene sheet, had been low-pressure moulded to give a lighting louvre, with square holes dished to yield an attractive decorative effect (Fig. 33). Polyester-glass sheets were shown in moulded form for lamp shades, and a novel item was a range of corrugated polyester-glass sheeting for roofing. From the peak of each corrugation to the trough, a strip of coloured glass cloth had been moulded in so that when viewed from one end the sheet appeared coloured. From the other end it appeared uncoloured. This speciality line has possible outlets for roofing patios and porches, the coloured sections facing the sun.

Addresses of Companies Featured in this Report

Aachen-Gerresheimer Textilglas G.m.b.H., Jacobistr. 11, Dusseldorf.

Alpine A.G. Maschinenfabrik u. Eisengiesserei, Gogginger Landstr. 66, Augsburg 2.

Ankerwerk Gebr. Goller, Rennweg 37, Nurnberg.

Battenfeld Maschinenfabriken G.m.b.H., Meinerzhagen (Westf.).

Hermann Berstorff Maschinenbau-Anstalt G.m.b.H., An der Breiten Wiese 3–5, Hannover-Kleefeld.

Eckert & Ziegler G.m.b.H., Weissenburg (Bay).

J. Evans & Son (Portsmouth) Ltd., Goldsmith Avenue, Portsmouth (England).

Johann Fischer, Abtlg. Maschinenbau, Lohmar Bez. Koln.

P. Flesch, Ludenscheid (Westf.).

Frieseke & Hoepfner G.m.b.H., Erlangen-Bruck, Bavaria.

A. Hagedorn & Co. Aktiengesellschaft, Lotter Str. 95/96, Osnabruck.

Harburger Eisen– u. Bronzewerke A.G., Hamburg–Harburg.

Herfurth G.m.b.H., Hamburg–Altona.

Hydro–Chemie A.G., Dreikonigstr. 21, Zurich 2.

Kautex–Werk Reinold Hagen, Hangelar ub. Siegburg.

Paul Kiefel G.m.b.H., Baierbrunner Str. 14, Munchen 25.

Korting Radio Werke G.m.b.H., Grassau/Chiemgau.

Mapre S.A., Diekirch (Luxemburg).

Rehau–Plastiks G.m.b.H., Rehau (Bay.).

Reifenhauser K.G., Troisdorf.

H. E. Schniewind, Postf. 84, Haan (Rhld.).

Ruth Schwabenthan Maschinenfabrik, Hasenheide 9, Berlin, S.W.29.

Alfred Schwalbach K.G., Blucherstrasse 35–37, Hamburg–Altona.

Albert Stübbe Maschinenfabrik, Kalldorf, Vlotho (Weser).

Paul Troester Maschinenfabrik, Hannover–Wulfel.

Varta–Plastic G.m.b.H., Wachtersbach (Hessen).

Vogt & Hartmann, Bretzenheimer Str. 24, Mainz-Weisenau.

Werner & Pfleiderer, Theodorstrasse 10, Stuttgart–Feuerbach.

R. H. Windsor Ltd., Chessington, Surrey (England).

World's Industry Employs Plastics

The original articles from which these abstracts are taken can be seen at the Patent Office Library, 25 Southampton Buildings, Chancery Lane, London, W.C.2. Photostat copies can be obtained from the same source, price 1/6 per page (postage extra). It should be noted that the page number given below the abstract is that of the page on which the article commences.

MATERIALS

New Plastics Fibres and Elastomers

In a paper read by Natta before the Sixteenth International Congress of Pure and Applied Chemistry in July, 1957, are presented very comprehensive data, first on the chemistry and molecular structure, more particularly of the polyolefines, secondly on new developments in the field of synthetic fibres. Reference is made especially to the use of polymers of very high melting point for fibres, namely polyparafluorostyrene melting at 280° C., polyalphavinylnaphthalene and polyorthomethylstyrene melting at temperatures above 300° C. The account concludes with new elastomers based on polybutadiene and polyisoprene. The concluding part of the account deals with the relationship between speed and type of polymerization and the molecular parameters of the catalyst itself. Among the catalysts referred to large titanium dichloride, titanium trichloride, venadium trichloride, titanium tetrachloride, venadium tetrachloride, and oxygen-containing organic compounds of tetravalent titanium. The account terminates with a lengthy bibliography.

(*Materie Plastiche*, 1958/Jan./3.)

Suprastyrol Sheet

A DETAILED account by Jungnickel of the styrene-butadiene acrylonitrile mixed polymer manufactured by the Bayer A.G., which, for injection moulding purposes, is marketed as Novodur and in sheet form as Suprastyrol. Mechanical and physical properties of the material are summarized in tabular form and particular interest attaches to Table 2 which demonstrates that down to —10° C. Suprastyrol is little affected by cold. The material is not resistant to concentrated organic or interorganic acids nor to many of the aromatic hydrocarbons, whilst equally it is attacked by powerful oxidizing agents. Against weak acids and alkalies, however, and against aliphatic hydrocarbons it shows good resistance. The weathering qualities of the material under conditions of prolonged exposure remain still to be determined by experience. Suprastyrol may readily be machined or formed into various shapes if previously heated. It is observed that with material over 3 mm. thick it is advisable to warm both sides of the sheet. Numerous adhesives are available which may be used on Suprastyrol, many of them being those supplied by Isar Chemie, Munich, Boston Blacking, Oberursel, Paul Heiniker, Pirmasens. When welding the material, a hot air method may be used as for p.v.c., the temperature 5 mm. from the nozzle being about 330° C., temperature at the point of welding on the sheet being 250° C. Strength at the weld zone is 90% to 95% that of the parent material. Although the notch sensitivity of Suprastyrol is less than that of other thermoplastics, stress raisers should be avoided. The article concludes with an account of various uses of the material, many of which take particular advantage of its high impact strength. A series of illustrations show drawn shapes, one of which weighs 1.8 kg. as compared with a similar aluminium component which weighs 4.5 kg. Production of the Suprastyrol component was very much more economical than in aluminium. One of the examples illustrates the greater ease with which complex forms may be directly produced in the plastic as contrasted with the numerous operations required for similar parts in metal. One illustration shows a crash helmet from 4 mm. thick Suprastyrol. The whole emphasis of the concluding section is on the many ways in which Suprastyrol is superior to metal.

(*Der Plastverarbeiter*, 1958/Jan./24.)

U.S. Polypropylene

INFORMATION published on polypropylene manufactured by Hercules Powder Co. suggests that it is produced by a polymerization technique different from those developed by Professor Natta although propylene gas is used. No details of the Hercules process are revealed but a table of properties is given. The Hercules plant is expected to have an annual capacity of 20,000,000 lb. and the polymer is priced at 65c. per lb.

(*Mat. in Des. Eng.*, 1958/Feb./155.)

New Laminating Resins

DESPITE the increased use of laminated plastics many potential applications are being lost through the inability of the resin to stand up to the rigid specifications demanded. Materials are needed with improved weathering properties, greater fire resistance, higher temperature resistance, improved flow, better impact strength, greater chemical resistance, and more rapid cure liner. Some of the newer resins are mentioned and attention is drawn to their particular advantages. The resins mentioned include a phenolic silane resin and a vinyl silicone. The biggest problem is weathering and more and more resins are being manufactured from a combination of methyl methacrylate and polyester which it is reported give excellent results.

(*Chem. & Eng. News*, 1958/Feb. 17/61.)

Epoxy Tools and Dies

THE increased use of reinforced epoxy dies for metal forming is reported. A new development by Union Carbide's Bakelite Co. announced this month is a material and process called Epoxy-Alloy. This consists of a new heat-resistant epoxy resin reinforced with either low carbon steel fibres, aluminium fibres or a combination of glass and steel fibres. Best results are obtained if the surface of the casting has an epoxy coating reinforced with chopped metal fibres which are sprayed on to the mould prior to casting. The advantages of this material are quoted as being, besides price, a continuous operating temperature of at least 350° F. and high conductivity.

(*Chem. & Eng. News*, 1958/Feb. 17/70.)

TECHNOLOGY

Polymerization Reactions

A COMPREHENSIVE review of structure in relationship to reactivity in the process of polymerization as initiated by radicals; this is viewed from the standpoint of resonance phenomenon. The author, Martin Guzman, considers the basic theories involved, then passes on to an examination of the reactivity of radicals and of monomers and to the chemistry and mechanics of co-polymerization.

(*Revista de Ciencia Aplicada*, 1957/July-Aug./289.)

Ionic Polymerization of Vinyl-type Monomers

PROGRESS in ionic polymerization processes is reviewed with emphasis on preparation of new stereoregular or eutactic polymers from olefins, ciolefins and vinyl ethers. New products such as polypropylene, high *cis*-polybutadiene rubbers and vinyl ether polymer adhesives can be prepared only by ionic polymerizations.

(*Ind. & Eng. Chem.*, 1958/Jan./107.)

Neutralizing Static

AN elementary account setting out the principles of and, practical means of eliminating, static charges on paper or plastic materials and of removing from these dust which has become strongly adherent as a result of the presence of electric charges. In this latter regard, special reference is made to trouble experienced with removing dust from plastic films, especially in relationship to cleaning prior to processing or printing or allied operations. Such dust sometimes cannot readily be removed by blowing and an apparatus is described combining an electro-static device for removing the charge on the dust, together with air jets which immediately blow it away.

(*Caractere*, 1958/Feb./83.)

Mathematics of Pressings

A TREATISE by Gut on the elementary mathematics and geometry of the development of various forms worked up from sheet plastic. Various practical examples are worked out.

(*Der Plastverarbeiter*, 1958/Jan./50.)

Working Polyester at Constant Temperatures

A DISCUSSION by Brendel on the advantages both from the production standpoint and as regards the mechanical properties of the

finished mass, of ensuring that the polymerization process for polyester resins stays at a constant temperature, such a temperature being fixed to give maximum possible production speed whilst at the same time not reducing the working period to such an extent as to make control difficult. Ideal conditions can be approached by the use of infra-red heating. An apparatus is described which may be built up from the appropriate elements to meet customers' requirements. It is pointed out that the infra-red heating element must be so mounted that it is parallel at all points to the surface being treated. Elements may be purchased with integral gold-plated reflecting surfaces; finally the whole apparatus may be screened with aluminium so that no heat is lost. A diagram is included in the account to elucidate the text. With such an apparatus it is possible to operate at constant hardening temperatures independent of room temperature. Additions of catalyst and accelerator may be considerably reduced.
(*Der Plastverarbeiter*, 1958/Jan./49.)

Moulding Economics

A MATHEMATICAL and economical treatment of the production of plastic parts by moulding.
(*Der Plastverarbeiter*, 1958/Jan./53.)

TESTING

Identification of Certain Chlorine Containing Polymers

HUMMEL describes an identification system for chlorine—containing polymers based on treatment of the sample with hot pyridine followed by the addition of alkali in methyl alcohol. Under varying conditions a series of characteristic colours are developed. Practical details are given for carrying out the test.
(*Kunststoff-Rundschau*, 1958/March/85.)

Temperature Effects on Plastics Laminates

THE results of tests on nine representative thermosetting laminates at temperatures ranging from —90° F. to 200° F. are given. The laminates tested have reinforcements of paper, glass, cotton fabric and nylon fabric with phenolic melamine, silicone and epoxy resins. The graphical results of mechanical and electrical tests make an interesting comparison and particularly notable is the impact behaviour of epoxy glass laminate through the temperature range which when tested crosswise has substantially higher values at both high and low temperatures than at room temperature.
(*Mat. in Des. Eng.*, 1958/Feb./109.)

MACHINERY

Injection Moulding Press

A DETAILED account is given of the Foucher injection moulding press, type FH.1500. This machine will handle an injection moulding up to 1,500 grammes in weight, with a projected area between 2,000 and 2,500 cm. sq. The thermal requirements for the injection chamber may be as high as 35 kW., motive power for the pumps being a 70 h.p. electric motor.
(*Industrie des Plastiques Moderne*, 1958/Jan./33.)

APPLICATIONS

Consumption of Reinforced Plastics

AN increase of 20% on 1956 in the consumption of reinforced plastics in the U.S.A. is reported. A breakdown of its end uses shows that the largest user is transportation taking 20% of the total. This outlet also shows the greatest growth over the previous year. Boats, construction, consumer products, and aircraft and missiles take 15% each of the total. All these products show increases with the exception of aircraft where the figure has dropped from 28,000,000 lb. to 25,200,000 lb.
(*Mat. in Des. Eng.*, 1958/Feb./212.)

Moulding Metal Aeroplanes

THE concluding section of an account by Dixmier and Lansac dealing with the moulding of model aircraft from reinforced polyesters. This part of the account covers a large scale model with a metal frame. The mould is made in "Daro"—a magnesia cement. The article consists of a series of short directives of an essentially practical nature covering the design of the model and the production of each component in detail.
(*Industrie des Plastiques Moderne*, 1958/Feb./25.)

Plastics Replace Cast-iron

A BRIEF note based on a report in Siemens-Zeit, 1957, No. 8, on the replacement of a cast-iron impeller by one in plastic in a pump for circulating coolant on a machine tool. It is noted that in a wear test under similar operating conditions, the cast-iron wore away much more rapidly than the plastic. The design of the pump was such that any tendency of the plastic rotor to swell was amply provided for by the casing clearance. The nature of the plastic used is not stated.
(*Der Plastverarbeiter*, 1958/Jan./63.)

Plastics in West Germany

A FIVE-PAGE table listing trade names of plastics produced in Western Germany in the form of semi-fabrications, together with the name of the manufacturer, the nature of the plastic, weldability or otherwise, specific gravity, colour, nature of surface, extensibility, limits of surface temperature, plasticizer, physiological characteristics, available form and dimensions.
(*Der Plastverarbeiter*, 1958/Jan./65.)

Explosion-proof Lighting Fitting

USE of the normal straight tubular form of fluorescent light or mercury vapour lamp in mines tends to be complicated by the fact that the provision of robust flame-proof and explosion-proof protective coverings is both difficult and expensive. In DBP 963,087 is described a composite discharge light and fitting in which the usual straight tubular light is replaced by one of coiled form. This is cast into a solid mass of transparent resin which not only renders it shatter proof but confers complete protection upon the electrical connections and eliminates all danger of these being damaged and causing sparking. Chokes, transformers and switchgear may also be cast in as an integral part of the fitting, the exterior shape of which is hemispherical thus obviating the need for all separate globes or covers, and which fits directly into the metal lamp housing. Acrylic resins or polyesters are suggested as the casting media. Such resins may be operated quite satisfactorily at temperatures of 90° C. to 120° C. The patent referred to is in the name of Horst Knapp (Bad Homburg) and G. Schanzenbach & Co., GmbH, Frankfurt a. M.
(*Bergbau Rundschau*, 1958/Jan./32.)

Protecting Concrete Surfaces

IN the course of an account surveying methods of treating concrete surfaces to obtain increased wear resistance, greater hardness, impermeability to water, and other properties, Duriez makes reference to the use of applied coatings of paints based on vinyl compounds (especially the acetates) and of polystyrene. He notes that the use of such coatings is rapidly increasing.
(*Revue des Agglomèrés de Ciment*, 1957/Dec./8.)

Plastics in France

A BRIEF one-page commentary on the use of plastics in France based on an examination of the display of these materials at various Fairs held in France during the past year. Reference is made to the wide field of application of plastics and especially to that of the polyester resin and polyethylene. Considerable emphasis is laid on the appeal of the surface finish and colours obtained with plastics as demonstrated at the marine exhibition. At the Packaging Exhibition, a very wide range of packs in plastics of all sorts was to be seen. Reference is made to the use of polythene or p.v.c. air-filled cushions as packing for glass vessels to prevent breakage in transport. A lightening fastener in "Flexithene" is noted. "Rilsan" polyamide film for the packing of foodstuffs which require sterilization has the advantage that it will withstand temperatures in excess of 100° C. G.M.G. Montreuil showed a film which, immersed in water, dissolves entirely in the space of one minute. It is used for the packing of sprays for agricultural use, for washing powder and similar products which are required to be used in measured quantities. In the dairy-industry exhibition were shown 40-litre milk churns in glass-fibre-reinforced polyester resins (Grosfillex) which are characterized by their light weight and economy in transport, by the fact that they can be moved around without the creation of an unpleasantly harsh noise, and in that they in no way affect the taste of the milk. In the Hotel Equipment Exhibition plastics were represented to only a small degree. Tradition in the hotel field is very strong and it is remarked that plastics were not to be seen among equipment for the kitchen or the dining room. On the other hand, for the public rooms of the hotel, plastic hangings, floor coverings and fittings for furniture were very much in evidence. In the Camping Exhibition, plastics made a very prominent display. For the padding of sleeping bags it is noted that "Tergal" and "Rhovyl" fibres are employed.
(*Kunststoffe*, 1958/Feb./64.)

High Polymer Science and Technology in the United States—Part 4

By J. GLAZER,* Ph.D.

In this instalment the author discusses the activities of the U.S. Rubber Company and the Naugatuck Chemical Company, and offers some comments on the recession. The photographs are by courtesy of U.S. Rubber Company.

ON my first morning in America, I noticed an advertisement in the *New York Times* featuring a " water spectacular " that could be seen by the public at the United States Rubber Company's showrooms in downtown New York. Could this be one of the new applications of high polymers as yet undreamed of in Europe ? Clearly an immediate trip downtown was called for and, in due course, I arrived at the showroom to discover that the spectacular was nothing more than an extremely sophisticated water fountain whose jets were illuminated by hidden, coloured lights and which danced to the music of an electric organ. It was in fact a good old American gimmick to entice the curious New Yorker or tourist into the showroom. And for me, at any rate, it served the purpose of a direct introduction to one of the largest rubber and plastics manufacturing organizations in the United States.

The Recession

The role of the U.S. Rubber Company in the present day economy of the United States is typical of that played by each of the companies making up the " big five." Firestone Tire and Rubber, General Tire and Rubber, B. F. Goodrich, Goodyear Tire and Rubber and U.S. Rubber, are today all vitally concerned with the problems posed by the recession that has hit hard at the car and allied industries. Although the total Industrial Production figures for the last six months show that the recession is somewhat more severe than those of 1949 and 1954, there are indications that a seasonal return to work is now occurring and that unemployment in the automobile industry is now lower, in several States, than it has been recently. I was in New York when the new, 1958 cars were announced. This was in the autumn of 1957, and already great difficulty was being experienced in selling these new models. A popular approach was to offer the potential buyer cash for his old model and allow him to drive away in a new 1958 model without having to pay the *first* instalment until six months later ! The immediate result of such a transaction was that the customer had obtained a brand new car in exchange for his old one *and* a substantial amount of cash. It has become clear, however, that this type of sale was unable to postpone, let alone prevent, the recession in the automobile industry which became more severe as the winter progressed.

Although figures of rubber production and consumption are not yet available for Spring, 1958, it is interesting to note that the production of synthetic rubber during January and February, 1958, is at a higher rate than the average for the preceding two years. During the same two months, the rate of consumption of both natural and synthetic rubber has dropped down to approximately 90% of the average consumption rate for 1956 and 1957. This apparent anomaly probably reflects the usual time lag between production and consumption factors, and the general opinion is that the recession will last at least until the late summer of this year. That the effect of the recession has not been more severe in the rubber industry as a whole is due to the foresight of the large rubber manufacturers and processors who have broadened their interests enormously during the last decade or so.

The extent of the breakaway that has taken place is well exemplified by the most recent sales figures. These show that all of the big five Companies are continuing to develop new products and are seeking new markets in spheres that are not wholly dependent upon the vagaries of the automobile industry. Thus, almost 70% of General Tire and Rubber's sales are of products other than tyres while the corresponding figure for B. F. Goodrich is 55% and U.S. Rubber, Goodyear and Firestone follow with 50, 40 and 33% respectively. This feature is perhaps one of the most important developments in the post-war rubber and plastics scene, for while there is no doubt that tyres are still excellent business and provide the basis of the American rubber industry, it is also quite clear that heavy chemicals, chemical intermediates and plastics are providing an ever-increasing proportion of total sales. Those who are today connected with the industry have every reason to be thankful for the far-sightedness of their industry's leaders 10 years ago.

U.S. Rubber Research Centre

H. E. Humphreys, Jr., the president of U.S. Rubber, joined the Company in 1938 and has watched its annual sales leap from $160 million to $900 million at the present time. Today, only one half of its sales originates from tyres and the remaining half is intimately connected with the plastics and chemical industries. The effectiveness of this policy is shown by the fact that, during 1957, some 20% of the company's profits came from products developed during the last decade, and they are following up this policy by planning to spend $120 million during the next five years on fundamental and applied research. To facilitate this research programme, U.S. Rubber have recently set up a magnificent new Research Centre costing $4 million at Preakness, New Jersey. This Centre, which was officially opened last September, occupies a 90-acre site and is beautifully situated in the heart of the countryside; yet, it is within easy reach of New York City. As with similar organizations of this size, the Research Centre is not the sole location of research in the organization. In fact, it is backed by a large number of laboratories situated at the many production plants distributed

An aerial view of the U.S. Rubber Company's new Research Centre at Preakness, New Jersey.

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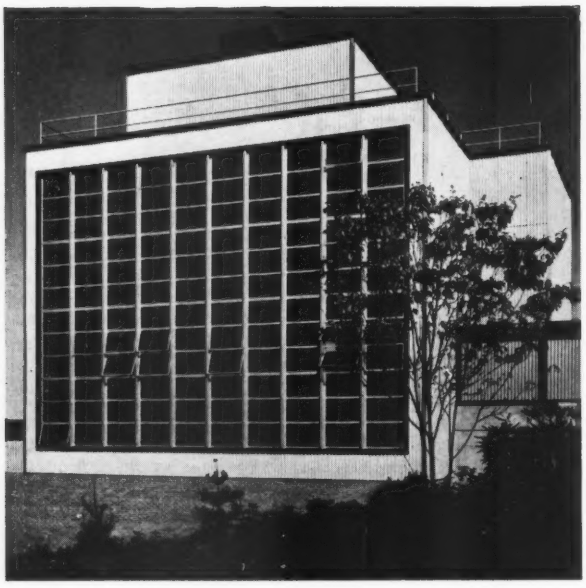


Chemical engineering laboratory at the Research Centre where polymerization experiments are performed up to pilot scale.

all over the country. It is characterized by the multiplicity of research interests and staff that are gathered together, under one roof. Each group of specialists is able to make its own positive contribution, while at the same time co-operating with other component groups so that the whole stream of research may, as far as possible, reach fruition in the same location.

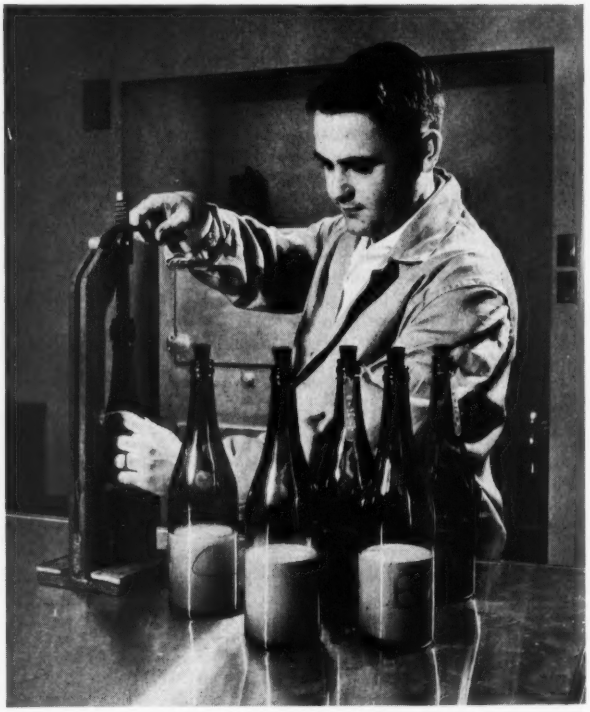
When I heard that U.S. Rubber had just opened the research centre that, they claimed, was the most modern in the rubber industry, I decided to visit there as soon as possible. This was very soon arranged by phone (almost everyone I met in the U.S.A. preferred to negotiate by phone rather than by letter; when possible, this saves an enormous amount of correspondence and valuable time), and I was made very welcome by Dr. L. M. White, one of the Research Directors at the Centre. He was at pains to point out that much thought had gone into the design of the laboratories and that they were very proud of both the facilities and architectural style of the buildings. And after I had been shown round, I was able to agree with him completely.

It seems almost redundant to say that the laboratories were superbly equipped. There were the inevitable double-beam infra-red spectrometer, the X-ray diffraction units and cameras, the electron microscope and the whole gamut of rubber and plastics testing apparatus. In addition, there were certain novel features and facilities that are worth special mention. Experience had shown that the most efficient and popular laboratory was the " two-man " size. These are 20 by 30 ft. in area and, by British standards, are luxuriously equipped. Almost every conceivable service is piped to the bench and, for obnoxious or inflammable vapours, this meant that the cylinders could be kept outside the building—an obvious help in reducing fire and explosion risks. Air-conditioning was complete throughout the buildings and extra ventilation was available for the laboratory fume-cupboards. The latter, unlike their British counterparts, may extend down to the laboratory floor so as to accommodate fairly tall pieces of apparatus without the need for the operator to have to climb bodily into the fume-cupboard (as I have had to do occasionally when collecting samples during the fractional distillation of particularly unpleasant liquids !) Although 600 sq. ft. may appear excessive for a small, unit laboratory, it becomes not unreasonable when due allowance is made for special items of apparatus, writing desk sections and for laboratory assistants.

Since much of the work is concerned with experiments involving highly reactive catalysts, inflammable vapour and liquid monomers and reactions under pressure, the danger of accidents is always present. Consequently stringent rules must be observed. For example, all persons entering the Chemical Engineering Laboratory had to wear a protective helmet, and it was amusing to see that some of the more artistically inclined members of the research staff had decorated the ladies' helmets with lace and flowers. Should any member of the staff require medical attention, however, a hospital unit is situated in the building and it is permanently staffed by qualified nurses. Facilities at the Centre provide for the exploitation of any particularly promising polymerization reaction right through from small scale (lemonade bottle) to pilot scale 50-gallon pressure reaction vessels. The latter were housed in the Chemical Engineering Laboratory where one could view several synthetic rubber plants in miniature. One side of this four-storey building was completely of glass and the resulting light distribution inside was excellent, although from the many open windows it was apparent that the staff could still discriminate between fresh air and " conditioned " air. This aspect of the architecture was in direct contrast to the B. F. Goodrich Research Centre at Brecksville, Ohio, whose exterior was constructed completely of brick without a single window, the idea being to achieve improved thermal insulation and so to save fuel in the bitterly cold American winter.

Other facilities included a 90 ft. square Engineering Workshop containing over 30 different types of metal processing machinery. An unusual sight in a polymer research centre was the greenhouse which houses more than 300 rubber trees. These are grown in sterile sand to which are added controlled amounts of food and tracer element chemicals. And this type of investigation reflects the still enormous interest that the natural rubber tree holds for the industry. U.S. Rubber owns almost 90,000 acres of rubber plantations in the Far East and these studies are being carried out with the object of further improving the yield per acre of natural rubber latex.

Investigations are being actively pursued with a 2,000,000 volt Van de Graaff electron accelerator as a result of which it is hoped to learn more about the process of radiation vulcanization, radiation ageing and radiation-induced initiation of polymerization reactions. I was very excited to see and handle a car tyre



A laboratory assistant at U.S. Rubber's Research Centre charges lemonade bottles for small-scale experiments of emulsion polymerization.

A young rubber tree being fed nutritional chemicals in the greenhouse of the Research Centre.

whose tread had been vulcanized by exposure to high energy electrons. It will be interesting to know its level of performance when test results are announced. I also learnt that the electron accelerator is being used to vulcanize golf-ball covers in order to overcome the stress-relaxation effects that arise from chemical curing. For this work, a golf-ball projector simulating the action of a strong drive off has been developed by U.S. engineers!

Naugatuck Chemical Company

When Charles Goodyear, in 1839, was discovering the use of sulphur to vulcanize rubber, he little dreamed that in the same town of Naugatuck, Connecticut, a huge plant would later arise to produce large quantities of chemicals for use in the industry that he virtually founded. The Naugatuck Chemical Company was founded in 1904 and its first product was sulphuric acid which it used to reclaim rubber. This reclamation process, now enormously expanded and using completely different chemical techniques, is still carried on today, and I was able to see worn out tyres being transformed into useful, reclaimed rubber at the rate of over 300,000 lb. per day. This product, still widely used in the rubber industry, is in great demand since it sells at roughly half the price of fresh rubber.

Alongside the reclaiming plant, stands a modern synthetic rubber plant where butadiene-styrene rubber is made. The type of product synthesized here is a premium grade, and is sold either in the form of latex or as a solid slab. It is, of course, more expensive than the standard polymer since it is specially designed for the electrical wire and cable industry. The polymerization plant contains over 30 reactors, each of which can handle batches of 3,000 gallons at a time. The monomer feeds are controlled with the aid of an enormous control panel where the operator can see at a glance exactly which reactors are in use, which latex batches are being stripped of excess monomers and which reactors are being charged. Also indicated on this master panel is the flow of ancillary chemicals, such as initiator, soap solution, modifier, coagulant, etc. Indeed, it is possible to follow through the whole manufacturing scheme without leaving the control panel. Needless to say, automatic devices are incorporated in the control mechanisms which prevent any possibility of the wrong chemicals being added to the vessels. I was fortunate in being able to see three new reactors which had just been completed. These were each of 10,000 gallon capacity, the largest of their type anywhere. In all, this plant produces over 20,000 tons of butadiene-styrene rubber per year.

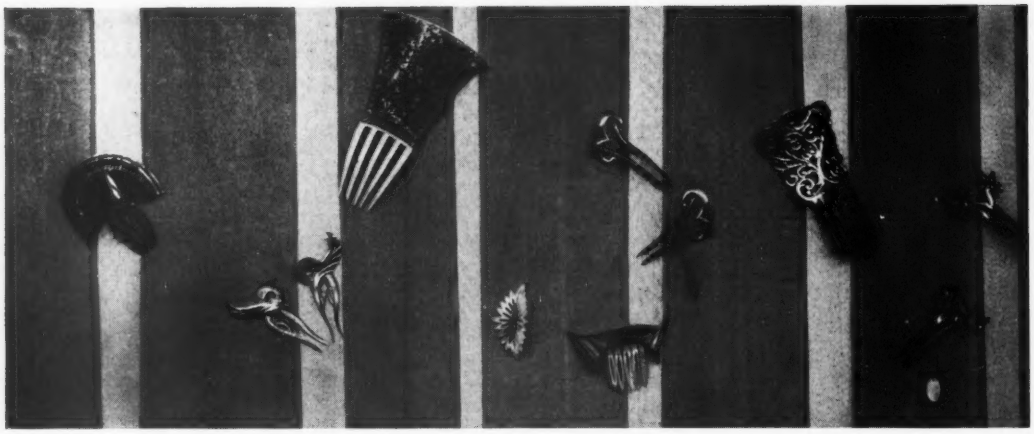
In buildings nearby, a whole host of rubber ancillary chemicals were being produced and evaluated. Amongst these were chemical peptizers, anti-oxidants, blowing agents, short-stops, chain regulators and plasticizers. These auxiliaries find use in the manufacture and processing of many of the Company's plastics and rubber-resin blends. Here is produced a whole series of polyvinylchloride resins specifically designed for easy calendering, extrusion, coating fabrics or plastisol and organosol applications. Polyester resins form another series of Naugatuck products which are finding wide application. I saw a translucent product of this type in the form of window and starlight panels. It was pale blue and was said to reduce glare while transmitting 60% of the incident light. It is a tough, anti-shatter material consisting of glass-fibre reinforced polyester resin.

A further product that has recently been developed on a large scale at Naugatuck is "Kralastic"—described as an "acrylonitrile-styrene copolymer blend." Although this product was first marketed just over 10 years ago, its suitability for conduit pipes shot consumption up to more than 1,000,000 lb. in 1953, and today it is estimated that over 6,000 miles of this material is used in piping. It is, of course, a type of high impact polystyrene, and I suspect that it is a physical blend of styrene-acrylonitrile and butadiene-acrylonitrile copolymers. It possesses all of the good ageing qualities of plastic piping and is used to transport crude oil, natural gas, salt water, corrosive chemicals and drinking water. Although polyethylene is almost a glut on the American market, its position may one day be threatened by this copolymer blend. And Naugatuck have backed their optimism in this respect by recently constructing a new plant in Baton Rouge, Louisiana, to triple their production. Apart from its use as piping, this polymer blend is now available in Britain in the form of thin sheeting, suitable for vacuum forming.

And finally, I must mention a new type of "three-dimensional" fabric, called "Trilock," which is made by weaving a pattern of polyethylene threads into a standard type of woven fabric and then plunging the whole into hot water. This results in the selective shrinking of the polyethylene fibres and produces a very attractive, puckering effect in the fabric. The extent of shrinkage is controlled by mechanical means during immersion and, by varying the pattern of the polyethylene insert, one can obtain remarkable three-dimensional effects.

(*To be continued*)

Loosely woven "Trilok" three-dimensional fabric developed for use in high altitude flying suits. Note the puckered effect produced by heat-shrinking polyethylene threads.



Oyonnax - Cité du Peigne

A commentary on the sixth French International Plastics Exhibition.

THE French call this small town, nestling between two ranges of the Jura mountains, the City of the Comb. If this rather grand name seems rather overweighted for a place a good deal smaller than Stratford-on-Avon it is clearly deserved if one thinks only of combs, and today also of household plastic mouldings. For there are some 200 moulding companies and their factories and only 12,000 inhabitants. Obviously the bulk of the works are small, and are generally family concerns; it must be one of the few towns in the world, if not the only one, so completely devoted to this industry. Most of the adult inhabitants work in the factories.

If the name is grand it is almost certain that it has been called that for nearly 1,300 years. Its history is very special. About 630 A.D. Leodogarius was sent by Dagobert I King of the Franks as head of a delegation to the King of the Burgundians at Geneva. On the road and outside Oyonnax his litter broke down and he sought help from the local inhabitants. These were not only expert wood workers, especially in the locally abundant box-wood, and repaired his litter superbly but they also presented him with various articles of their manufacture as a souvenir of his stay. Leodogarius, the future Saint Leger, in due course became Bishop of Autun and Minister. He never forgot the Oyonnaxiens and gave them the monopoly to manufacture box-wood combs. After his death when he was canonised, St. Leger was chosen as the patron saint of Oyonnax.

Towards the end of the 18th century, horn was worked and so began the first semblance to moulding. By 1860 there were 120 presses in the town used for flattening and otherwise shaping the hot-water-softened sheets. Then followed celluloid rather late in 1886. The records show that more than 2,000 workers were employed in the town at that date.

The comb industry here has had its ups and downs—more especially when, under Napoleon III, the ladies of the court started the net fashion of keeping their hair under control, and, of course, immediately after the 1914–18 war when short hair was " all the go."

The real horn comb, hand-made, is now something of a rarity, and few, for example, in this country, know of them or only remember they did once exist. They are, of course, comparatively costly, but they have the beauty of a natural growth, and its amazing strength which so far has never yet been attained by any plastic we know. It may well be that this specialized industry and that of any production of hand-made fancy goods in plastics is a dying industry. The people of Oyonnax themselves fear that it is. We can only hope that it will take an " unconcionable time a-doing so." This is not to say the Oyonnaxiens could not do something about it. There remains a small number of such companies and the pity is that so little is known about them in the outer world. They rarely, if ever, advertise their wares in any journal we know even, in France.

All this preamble because in late, April we had the pleasure of visiting the town on the occasion of the 6th Annual Plastics Exhibition, and we hope that the few pages devoted to it here will not be dwarfed by the description on pages 195–206, also in this issue, of the vastly greater and infinitely more mechanically and technically important exhibition at Hanover that followed closely after, in May.

The Oyonnax Exhibition is not a big one nor is it in the modern style as we know it. The grounds are in the square backing the railway station so that space is limited. All stands are small, simple, and relatively of very low cost.

There were three separate sections in very temporary structures

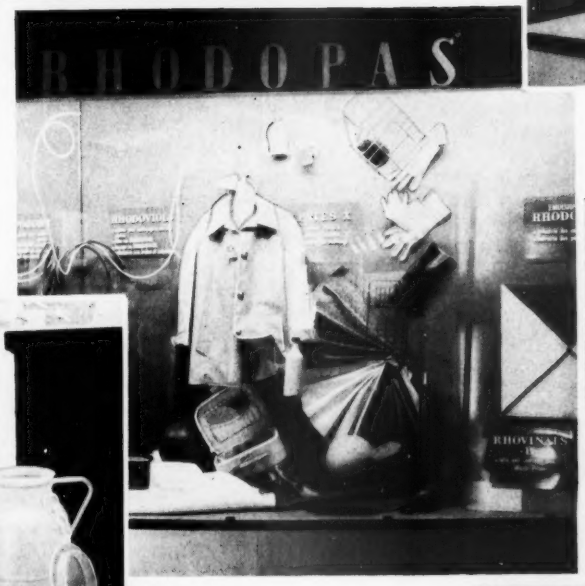
A typical example of the art of Oyonnax—the use of plastics and stones to create the latest fashion in sun-glasses. Hand-made by Etáb. G. Marmet.

(Left) Polythene watering can for the garden and industry, moulded by Robert Oulion.

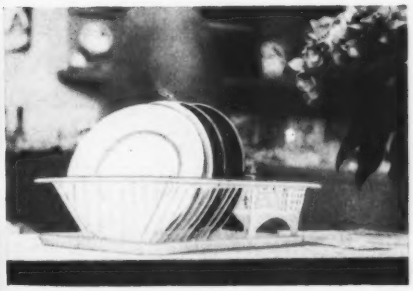
(Right)Polythene dustbin injection moulded by Lacroix " Gilac."

(Right) Examples of clothing, travel goods, etc., in Rhone-Poulenc materials.

(Below) Polythene milk churn made by Grosfillex.

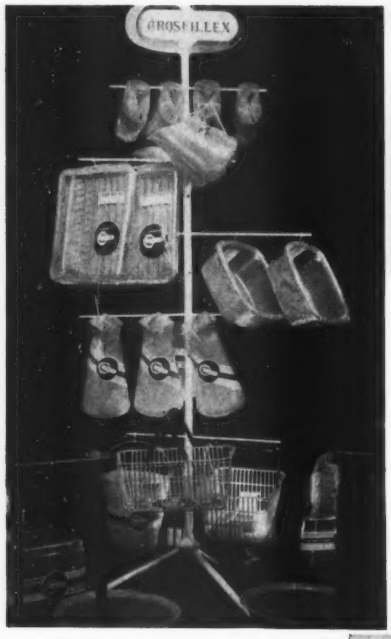


(Below) Injection moulded polystyrene dish-rack by Salvay et Fils.



(Below) Children's chair-cum-pot, in polythene, by S.T.A.M.P. Silent, comfortable, and functional !

(Below, left) Vehicle front, measuring 5 ft. by 5 ft. 6 in., in polyester-glass, shown by Ets. Convert.

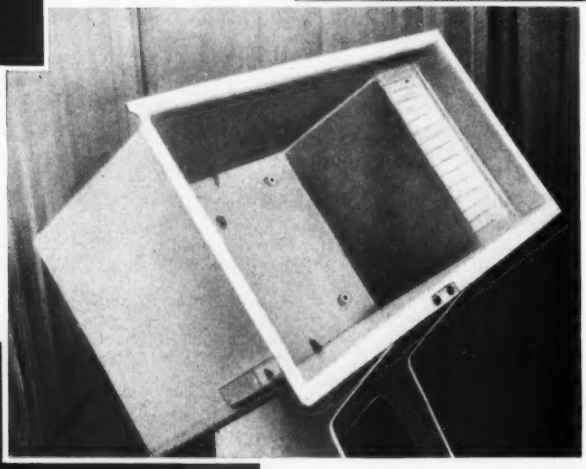


(Above) Polythene housewares attractively displayed by Ets. Grosfillex.

(Left) Fisherman's basket in p.v.c., shown by Salvay et Fils. The simulation wicker work is in fact moulded.

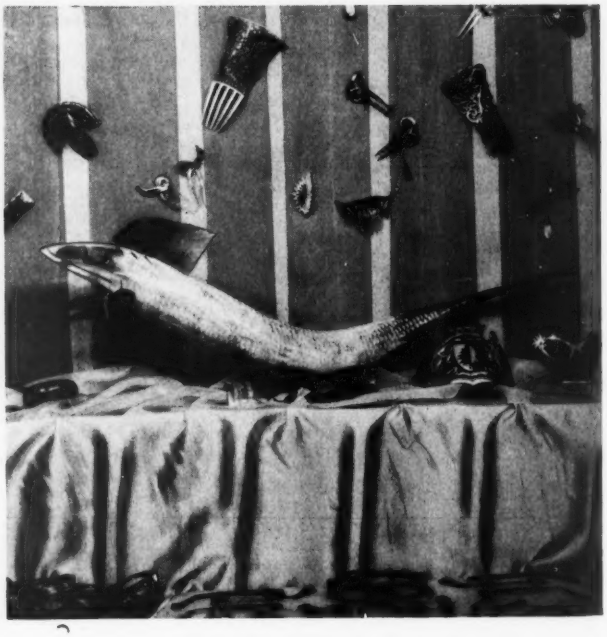
(Below) Polythene petrol cans and industrial containers, injection moulded in polythene by Kerplas-Desjonqueres Plastiques.

(Below) Vacuum formed refrigerator liner in polystyrene shown by Monsanto-Boussois S.A.



(Below) The centre-piece of the display of the Chambre des Metiers de l'Ain. The magnificent fish is an example of past craftsmanship in horn. Around it are contemporary and traditional hand products of the Oyonnax district, the home of plastics in France.

(Above) Examples of the "Skinplate" process, shown by Ets. Arnaud, p.v.c. bonded to metal. This exhibit created great interest.



The entrance to the National College of Plastics Technology of France.

segregated under: raw materials, finished mouldings and machinery. There were some 100 stands in all.

To return to the "hand-made" problem again, we can look at the photograph at the head of the preceding page (212) and also at the one at the foot of the same page. The stand here is a collective one by the few remaining companies who specialize in this work and all the exhibits here may be called "museum" pieces, from the brilliantly carved high Spanish combs to the modern cunningly jewelled sun-glasses shown below. A real museum piece is the remarkably fine fish (page 214) fashioned from horn. It is a work of art and of the highest craftsmanship that will probably never be repeated, more's the pity.

Today Oyonnax uses all the new plastics (although very few of the thermosetting type) and produces in addition to combs, vast quantities of spectacles and sun-glasses, plastic "jewellery," ornaments, souvenirs, artificial flowers, toys, household goods and the thousand and one other "fancy" goods that can be turned out by the million on injection machines. It must be a unique town for in the space of one or two square miles the number of such machines installed must be of the order of a thousand or more.

We have stated that Oyonnax uses very few thermosetting resins. Generally speaking we should say that technical moulding is not commonly carried out. This must be surely due not only to its history but also to the geographical position. The terrain which has certainly made it somewhat remote coupled with the sturdy individuality and independence has conflicted with the other geographical fact that the great industrial customers are by no means near enough to permit of rapid consultation from design, technical and economic collaboration. Lyon has its own big moulders and most customers of the technical type are in Paris, Marseilles, Lyon, St. Etienne, Lille and the other busy northern towns, Bordeaux, Toulouse, Brest, and so on.

This is not to say that plastics technology is not strongly developed. From many points of view indeed it is probably stronger here than elsewhere. The majority of workers on the machines are true technical artisans and this applies also (which is not so common in this country) to directors, managers, designers and salesmen. Almost everyone can take his turn on the job, even knows enough metallurgy and engineering to make simple, and, often, complicated moulds with his own hands, knows a good deal about the properties of plastics and their suitability in applications, are extremely ingenious in modifying machines and keep closely in touch with new developments.

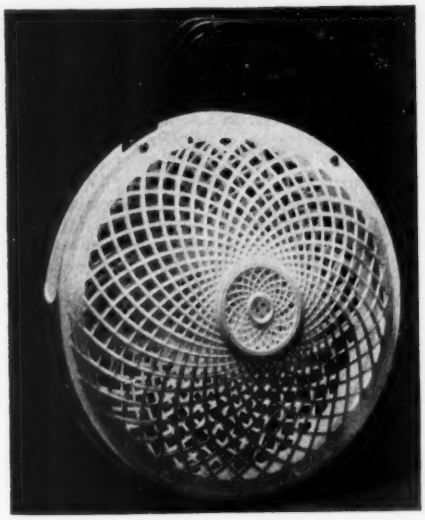
The reason for this common high standard is not to be wondered at, for the key feature in the development of the plastics industry at Oyonnax and indeed it applies to the whole of France, is the National College of Plastics Technology (L'Ecole Nationale Professionnelle des Matières Plastiques), a magnificent building stationed in Oyonnax itself.

To the visitor, especially from Great Britain, the most astonishing feature is the size and scope of this French institution. As will be seen in the photograph above, the building is substantial, and in fact is in the shape of a square with a quadrangle in the middle. It provides residential accommodation and teaching space for over 550 students, and in size is comparable with a complete major English polytechnic.

Students undergo courses of various length, from intensive short periods to four years. They graduate as qualified technologists, having studied chemistry, physics, engineering, plastics technology and certain other ancillary subjects. Students also undergo a special course in plastics art, on the principle that familiarity with a material in the way it handles will help the student to comprehend more clearly the practical applications which may exist for it.

The contribution of the National College to the French plastics industry is held, by French industrialists, to be enormous. By providing a steady flow of well-trained men, the college ensures that the rapidly growing industry is not handicapped by lack of competent recruits. The very existence of such a major school also gives the plastics technologist an identity and status which is most valuable. The British plastics industry may reflect, somewhat unhappily, on its own tardiness in securing for the United Kingdom a similar centre.

The picture pages accompanying these notes give, we think, a good cross-section of the type of work carried out. As we have said the most important tool is the injection machine and judging from the size of many of the jobs, e.g. jerry-cans, dust-bins, milk-churns, and watering-cans, the machines are not all small, indeed some are of 32-oz. capacity. As will be seen, many applications are novel—we especially remarked again, the milk-churns which so far have never been made in this country. They were first made in France some three or four years ago, so that there has been ample time to have proved their value. British moulders may have tackled the problem, but to date we have not seen them in the market.



For the beach or for shopping; a newly designed polythene bag. This sample was vivid yellow with a black handle.

(ADDRESSES OF COMPANIES MENTIONED IN THIS REPORT: Ets. Arnaud, 22 Boul. de la Bastille, Paris (12). Ets. Convert, 10 Rue Voltaire, Oyonnax (Ain). Ets. Grosfillex, Arbent (Ain). Kerplas-Desjonqueres Plastiques, 13 Rue Taitbout, Paris (9). Lacroix "Gilac," Rue Jean-Donier, Oyonnax. Monsanto-Boussois S.A., 22 Boul. Malesherbes, Paris (8). Robert Oulion, 5 Impasse de la Carette, Lyon. S.T.A.M.P., 3 Place Emile-Zola, Oyonnax. Salvay et Fils, 11 Rue Pasteur, Oyonnax.)

New Productions

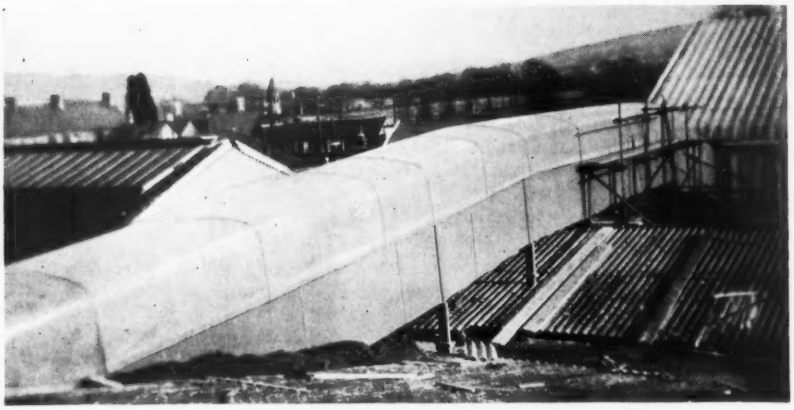
Glass/Polyester Bridge

When United Dairies, Ltd., desired to enclose and weatherproof a bridge at their plant in Whitland, Carmarthenshire, to facilitate the transfer across it of milk powder, the task was presented to their transport subsidiary, Mickleover Transport, Ltd., Whitby Avenue, London, N.W.10, because of this company's experience in the production of glass fibre reinforced polyester-resin components.

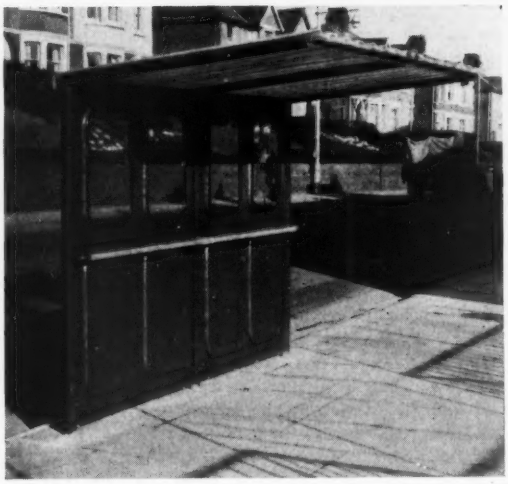
Approximately 150 ft. in span, the bridge did not lend itself to the fitting of side panels and curved roofing pieces all of similar size and shape because the elevation of the girders varied and there were alterations in plane along its length.

Along the sides of the girders were fixed flat panels pigmented grey and containing 4 oz. of chopped-strand glass fibre mat per sq. ft. The unpigmented roofing sections were moulded by the contact process. Beck Koller Filabond 8001, to which a proportion of Filabond 624 was added, was used, but the overhead pieces contained no fillers because their translucency would have been impaired. Density of the mat in these section was 4½ oz. per sq. ft.

Plastics stiffeners were incorporated in the curved components during the laying-up process, and joints between them were joggled for further rigidity.



(Above) Glass fibre and polyester resin used to enclose a bridge upon which milk powder is transported.



(Right) Shelter constructed from panels of glass fibre reinforced polyester.

Glass Fibre Rocket Packs

It can now be disclosed that the Royal Navy's new all-weather fighter—the Sea Vixen—carries a secondary armament of 28 2-in. air-to-air rockets internally, in addition to the de Havilland Firestreak guided weapons, up to four of which may be carried externally.

The 2-in. rockets are stowed in two batteries on the underside of the fuselage; on pressing the firing button these extend into the slip stream retracting immediately the rockets have fired; once the firing button has been pressed the whole operation is automatic.

Microcell Ltd. designed and produced the Sea Vixen's 2-in. rocket packs, which are of glass-fibre reinforced plastics material.

Glass Reinforced Plastic Bus Passenger Shelters

Longwell Green Coachworks Ltd. have had extensive experience during the past few years in development of reinforced fibreglass construction for the motor trade, both on commercial as well as on public service vehicles. This experience, together with the practical knowledge of Mr. R. A. Hawkins, A.M.inst.T., of Newport Corporation Transport Department, has enabled a first-class bus shelter to be produced.

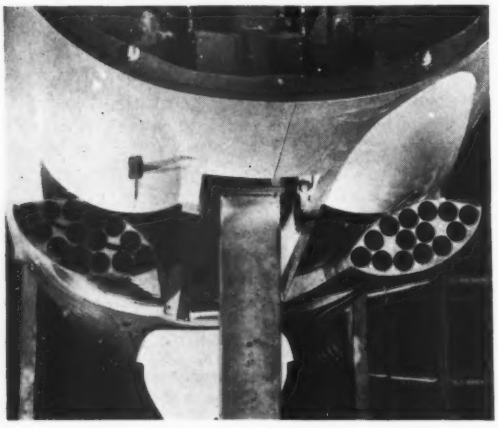
The shelter is made in 5-ft. sections, in reinforced glass-fibre/Beetle polyester resin construction. The front panel is designed to allow two large windows to be fitted, and the panel is colour-impregnated.

The roof panel is constructed so that it can be supported on the cantilever principle. The roof panel is also corrugated to allow easy drainage, and is made translucent, thus making the shelter reasonably light.

No maintenance will be necessary, painting being eliminated. The panels are entirely non-corrosive. The translucent roof panel allows the shelter to be well lit. The panels are easily handled, and can be kept in store, to be erected when further demands make this necessary.

In spite of the advantages of this type of shelter, the cost is certainly no greater than the cost of orthodox types.

Beetle polyester resins, used in the construction of these passenger bus shelters, are manufactured by B.I.P. Chemicals Ltd., Popes Lane, Oldbury, Nr. Birmingham.



Rocket packs produced in glass fibre/polyester resin on the Sea Vixen.

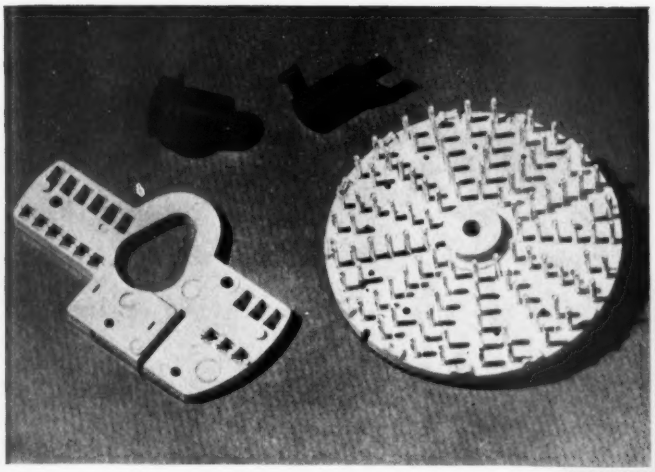
Record Size Cinema Screen

The biggest cinema screen in Britain—71 ft. wide by 28 ft. 6 in. high—was tailor made in plastics for the Cinemiracle film "Windjammer," which had its Press showing at the Odeon, Tottenham Court Road on Tuesday (May 13th).

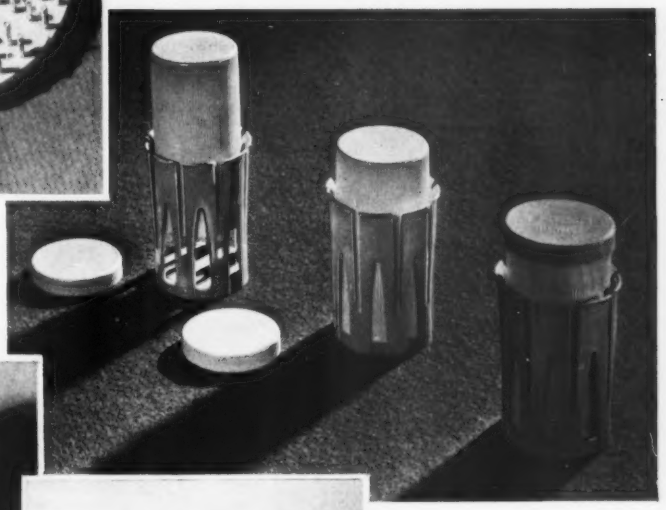
Made of polyvinyl-chloride, it was specially manufactured by Andrew Smith Harkness Ltd., of Borehamwood, Herts., a company within the Rank Precision Industries group, who are famous for making screens of any size to order.

The giant screen is seamless, curves to a depth of 10 ft. 6 in., and has the greatest field of view yet presented in this country.

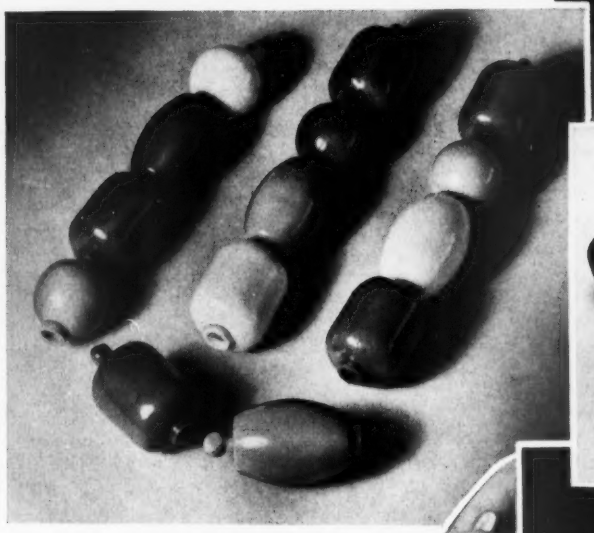
It expands beyond the proscenium arch into the auditorium. The frame measures 71 ft. by 30 ft.



(Left) The mouldings from Bakelite phenolic black X.17165 and alkyd DX.18926 used in the Fireball turret tuner. The large circular moulding has 104 metal pins inserted through it and raised identifying channel numbers 1–13.

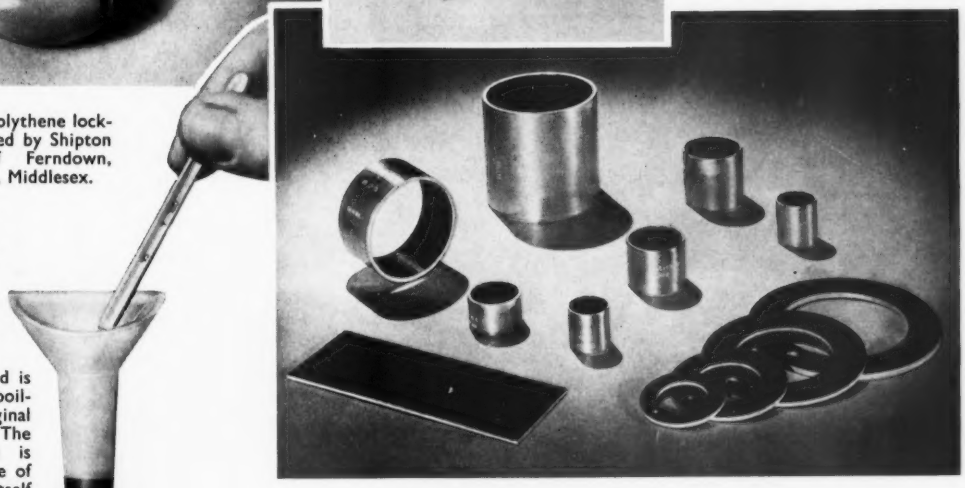


(Right) The solidified Air-wick deodorant recently designed by Airkem Inc., New York, will be test marketed in the near future in this country in a new dispenser moulded in Styron 475 Polystyrene by Tratt Plastics Ltd., of Lightwater, Surrey.



(Above) A blown polythene locking toy manufactured by Shipton Plastics Ltd., of Ferndown, Northwood Hills, Middlesex.

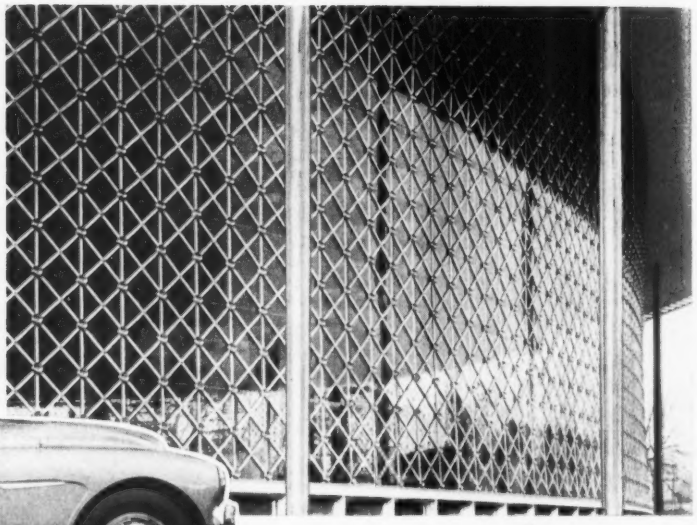
(Left) Plansel anti-abrasion coil, made by Creators Ltd. of Woking, is made in continuous lengths of ½ in., ¾ in., 1 in., 2 in., and 2½ in. bore.



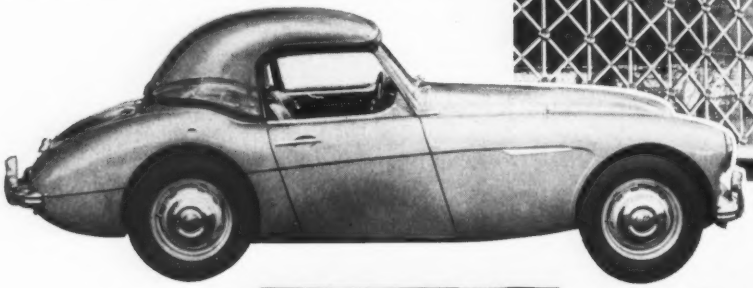
(Above) A range of new p.t.f.e. impregnated dry bearings introduced by The Glacier Metal Co., Ltd., of Alperton, Wembley, Middlesex.

(Right) A new plastic thermometer holder, which provides the complete answer to the problem of storing clinical thermometers, is announced by Ekco Plastics Ltd. Moulded in a special, recently-developed grade of nylon, the Ekco thermometer holder is not stained by antiseptics and is impervious to sterilizing by boiling, whilst retaining its original resilience and strength. The breakage of thermometers is greatly minimised by the use of the Ekco holder, which is itself unbreakable. A concealed fixing bracket, moulded in similar material, is provided, enabling the holder to be easily removed for sterilizing all parts which contact the thermometer.

(Right) The largest circular building of modern times, the United States Pavilion at the Brussels World's Fair, has walls of Union Carbide rigid vinyl sheet affixed to a steel frame with golden coloured screws.

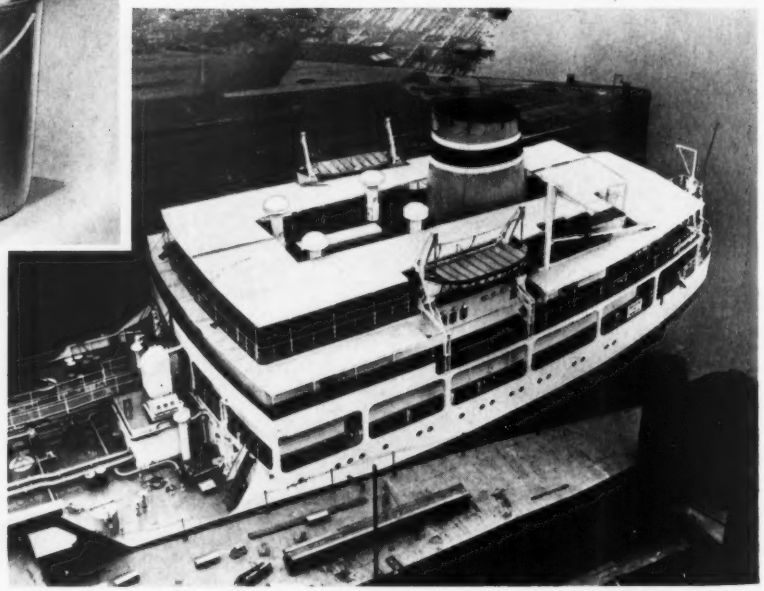


(Below) This Perspex "Pexidome" is fitted to an Austin Healey 100/6, of which the first models so equipped have just been sent to the U.S.A. The new transparent hardtops are produced by the Triplex Safety Glass Co., Ltd., at their Willesden factory and are fitted by the Pexidome Co., of Bayswater, London, W.2.



(Right) Cellobond polyester resins and glass fibre were used by Conran & Co., Ltd., Cadogan Lane, London, S.W.1, to mould the sun which is 8 ft. in diameter and is suspended in John Michael's outfitting shop in Chelsea. The resin was pigmented in two shades of yellow to make the features and "sunrays" stand out.

(Right) Diapersol container for soiled diapers, with pail and handle moulded from Tenite polyethylene. Every time the container's special lid is raised, it dispenses a few drops of Diapersol liquid which prevents the formation of ammonia—chief cause of diaper rash and diaper odour.



(Above) Corroplast permanent awnings made by Holoplast Ltd. from laminated plastic are used fore and aft on the "Irish Hawthorn" and stove-enamelled by the makers in a pleasant green shade to relieve eye-strain under tropical sunlight.

(Left) Pytram Ltd., of West Molesey, Surrey, have produced in polyester glass fibre laminates the well-known trade mark "Babycham" standing 12 ft. high by 7 ft. long and 3 ft. wide, with a weight of only 2 cwt. Chopped strand mat and polyester resins were used in the fabrication of this model, which is being erected on the roof of the new factory of Messrs. Showerings Ltd., of Shepton Mallet, Somerset.

Plastics News

Plant and Equipment, Materials, Processes, Company News, Technical Literature, Exhibitions, Personal Notes and Meetings.

KESTNER DIAPHRAGM PUMP.—These pumps are manufactured in three sizes, namely, 1 in., 2 in., and 3 in., and are capable of discharging 200, 750 and 1,500 gallons per hour, respectively, of corrosive fluids against a maximum working pressure of 25 p.s.i. All sizes are available both as portable and stationary units. The pumps combine all the advantages of conventional diaphragm type pumps, namely, positive action, glandless characteristics and high suction performance; lifts of 22 ft. of water being easily obtained. They have an added advantage in that the body is constructed throughout from Keebush, the company's special corrosion-resisting plastic material, no linings being employed. The diaphragm and ball valves are constructed from special synthetic rubber suitable for the corrosive fluid to be handled. Further details of these pumps and other chemical plant can be obtained from Kestner Evapourator & Engineering Co., Ltd., 5 Grosvenor Gardens, London, S.W.1.

HAND-OPERATED BENCH MOULDING MACHINE.—Up to 400 shots per hour (depending on mould design and materials used) are reported as being possible with the S.R.S. Machine, manufactured by S. R. Seymour and Co., Ltd., Brook Road, Rayleigh, Essex. This high rate is made possible by the vice/ejector mechanism which by a movement of the vice lever opens the mould and ejects the moulding in one operation. Returning the lever to its original position closes the mould which is then ready for a further injection. The cylinder has a capacity of ¾ oz. (21 grammes), and is fitted with a leak-proof nozzle. Both the cylinder and ram are made of nickel chrome steel. The heater is of 250 watts. capacity with a range 0–300° C. Thermostatic control, neon warning light, and a Rototherm thermometer are fitted.

GUYSON DE-FLASHING PLANT.—This unit is specially designed for rapid removal of flash from thermo-set moulding where, in many cases, it is impossible to de-flash by dies due to the awkward shape of the article or the presence of metal inserts. It is also possible to remove flash lines from the metal inserts very quickly without laborious hand fettling.

The operator is seated at the front of the Unit, and a side loading hopper for mouldings ensures a steady supply to the left hand of the operator inside the cabin. A blast gun controlled by a left hand foot pedal directs a stream of special compound on to the moulding and this removes the brittle flash very quickly without harming the bright surface finish. The component is then blown with a compressed air jet operated by the right hand foot pedal, and ejected through a duct in the right hand side of the cabin. A vision window is provided, and illumination of the cabin is by overhead light shade.

The Guyson Model S.B.P. can operate on many different sizes and shapes of mouldings and can also be used with abrasive compounds merely by changing the contents of the hopper.

HIGH DENSITY POLYTHENE TUBE FOR COLD WATER SERVICES.—The use of plastics tube for cold water services was carried a stage further on Monday, June 2, when the British Plastics Federation published a specification for tube for this purpose made from high density polythene.

This will be the first specification for high density polythene for piping. It aims at taking advantage of the increased toughness of the material as compared with low density polythene piping and ensuring its use in correct thicknesses.

General

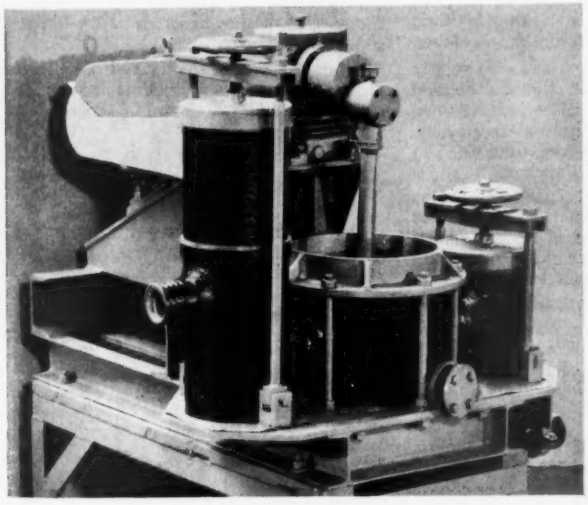
Price Reduction.—The Pittsburgh Plate Glass Company announce a reduction in the price of their rovings. These rovings are packaged with a uniform tension that improves automatic feeding, and in addition to 140's yarn in standard 35 lb. 60 end packages, Pittsburgh's Roving is also supplied in 12 ends and 24 ends.

Further information regarding these materials can be obtained from: Omni (London) Limited, 35 Dover Street, London, W.1.

Plastics Container Factory.—The Dominican Republic Development Commission states that among new industries planned for the Republic is a factory for the manufacture of plastic containers. These will be used for the packaging of Dominican crops, particularly bananas.

Curing of Resin/Glassfibre Laminations.—The illustration on page 220 shows an Isomantle used for curing of radomes made from glassfibre/resin laminations by the Bristol Aircraft Co., Ltd. The electric heating mantle is made in two parts each comprising two hinged halves for easy application over the mould. Automatic controls are fitted to the outer metal casing of the heating mantle, allowing individual regulation of each of the seven horizontal heating circuits, which ensures perfect graduation of the heat input over the whole surface of the radome. These and other types of electric surface heaters are made by Isopad Limited, Boreham Wood, Herts.

Horners Award.—New regulations for entry for the Horners Award, the annual competition



Corrosion resistant diaphragm pump made by Kestner.

De-flashing mouldings in the Guyson machine.

organized by the British Plastics Federation for the Worshipful Company of Horners, for the purpose of encouraging young designers in plastics, have been issued to art schools and colleges all over the country.

This year, it has been decided to concentrate on one prize—of up to 50 guineas—and the competition is open to all British residents not over 30 years of age on September 30, 1958.

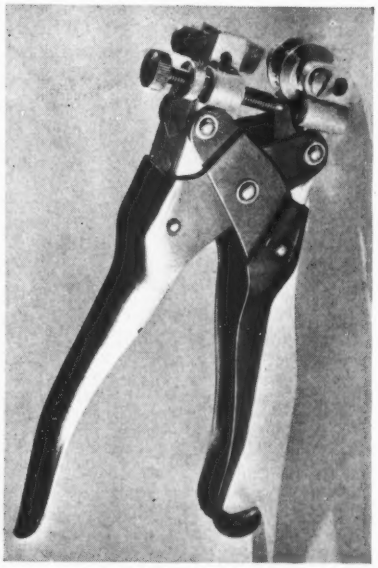
As in previous years, the award will be presented to the winner at a dinner of the Worshipful Company of Horners to be held in an ancient City livery company's hall in London.

Inserts.—Hitherto manufactured in the U.S.A., and now being produced under licence in this country by the Precision Screw & Mfg. Co., Ltd., of Willenhall, Staffs, the Precision Banc-Lok Self-Locking Insert is especially engineered for use in wood, plastics, castings and moulded parts. It is available in aluminium, brass, steel, and stainless steel, in a wide range of sizes and designs.

Alkathene Design Competition.—The Plastics Division of Imperial Chemical Industries Limited is organizing an annual design competition for retail articles moulded from Alkathene. A cheque for £50 and a miniature silver trophy will be awarded to the winning designer. Certificates of merit will also be given in respect of the articles gaining second and third places.

Any retail article which has not been marketed before January 1, 1958, may be entered for the competition which closes on October 31, 1958. Moulders may submit as many different articles as they like. The results of the competition will be announced in November and the awards presented early in December.

The panel of judges will consist of Paul Reilly, Deputy Director of the Council of Industrial Design, K. W. Luckhurst, M.A., Ph.D., Secretary of the Royal Society of Arts; a representative of the Design Committee of the Plastics Institute; and J. V. Crossley, a director of I.C.I. Plastics Division, who will also be chairman of the panel of judges.



Cable stripping pliers developed by Creators Ltd.

Isomantle used for curing glass/resin radomes at Bristol Aircraft Ltd. See paragraph on page 218.

Plastics Industry Education Fund—Training Course.—The Trustees of the Plastics Industry Education Fund are again inviting applications from young men or women working in the Plastics Industry for Training Grants towards the cost of a year's full-time study.

Full details may be obtained from the Secretary of The Plastics Institute, 6 Mandeville Place, London, W.1. Applications for Grants must be submitted by July 12, 1958.

New Polyester Resin.—Cellobond AX.2710, a new polyester resin, is described in an Information Sheet recently published by British Resin Products Ltd.

This resin has been specially designed for use in the manufacture of flame resistant translucent panels. In addition, it is particularly suitable for use in the production of transparent corrugated roof lighting, possessing excellent light stability and self extinguishing properties.

Compounding types of reinforcement and methods of use are discussed and notes are given on the production of corrugated sheeting.

Copies of the Information Sheet No. P.110 can be obtained free from British Resin Products Limited, Devonshire House, Piccadilly, London, W.1.

Material Grades of p.t.f.e.—Crane Packing Limited, of Slough, have developed solid raw material forms of polytetrafluoroethylene (p.t.f.e.) in a number of grades, eight being so far available. The term "grades" is not connotative of the quality or purity of the products, but serves to distinguish between the different properties developed in them, either by processing, or by the use of additives.

Grades 7 and 8 are examples, and contain reinforcement in the form of fibre glass. This addition to the basic material virtually eliminates cold flow and imparts better heat transfer properties; dimensional stability is also improved, and tolerances in the order of ± .001 in. are possible when machining these grades.

The properties imparted to Grades 7 and 8 make them suitable for use as bearing surfaces such as bushes or thrust discs. These have been applied at maximum loadings of 40 p.s.i., temperatures up to 200° C., and at rubbing speeds of up to 1,000 surface feet per minute.

The difference between these two grades is simply in the preparation of the material, Grade 7 being most suited to large moulded components, and Grade 8 to small moulded components and extrusions of limited size.

Crane Information Bulletin No. 15 contains a description of these and other grades.

Sales of Plastics in 1957.—Sales of plastics materials in 1957 totalled 393,000 tons. This was an increase of 56,000 tons or 17% over 1956, and compares with a rise of 7% for a year earlier; while the rate of increase in sales in the first three quarters of 1957 was 18% to 19%, that in the fourth quarter was rather less, at 10%. Exports of plastics materials as such totalled 106,000 tons in 1957, an increase of 13,000 tons or 14% on exports in 1956. Exports did not vary much from quarter to quarter, although by the end of the year they had reached a record level. Imports at 33,000 tons in 1957 were 10,000 tons higher than in 1956; in the third and fourth quarters of the year they reached record levels. The increase in imports and in sales of home-produced plastics materials resulted in consumption of some 53,000 tons, or about 20%, more than in 1956. In the fourth quarter of the year the higher rate of consumption was maintained by the high level of imports.

The increase in sales of plastics materials was mainly in thermoplastic materials where sales were nearly 27% more than in 1956. The main contributors to this expansion were polyethylene, polystyrene and polyvinyl chloride.

Sales of thermosetting materials were 5% more than in 1956. Sales of casein plastics continued to drop. Sales of polyesters and epoxide resins, although still small, continue to grow very rapidly.

The figures in the following table were compiled from returns from over 150 firms known to have been manufacturing plastics materials, whether for sale or for use in the production of plastic goods or other goods containing plastics materials. Paint manufacturers who make plastics materials, e.g. alkyd resins, for incorporation in their finished products, are included. Firms making cables who manufacture plastics materials from purchased resins are excluded, as are those making synthetic materials for use as textiles. The figures are free of any duplication or double counting of plastics materials at the different stages of production.

An explanation of the method of collecting the figures was given in the first article in this series published in the Board of Trade Journal on November 20, 1955.

TABLE I. NET SALES AND EXPORTS OF PLASTICS MATERIALS IN 1,000 TONS

Year	Net Sales			Exports
	Thermosetting materials	Thermoplastic materials	Total	Total
1950*	105	50	155	35
1951*	130	65	195	53
1952*	110	70	180	42
1953*	110	100	210	56
1954	143	130	273	70
1955	160	156	316	79
1956	161	176	338	93
1957	170	223	393	106

* The sales figures for these years are estimated.

NET SALES OF PLASTICS MATERIALS IN 1,000 TONS

Material	1954	1955	1956	1957
THERMOSETTING MATERIALS				
1. *Alkyds* :				
Solid and liquid resins	29.6	28.1	30.6	33.7
Solutions, etc.... ...	4.2	7.5	8.6	9.4
Other	—	0.3	0.3	0.4
Total	33.7	35.9	39.6	43.5
2. *Aminoplastics* :				
Resins, including solutions	23.9	26.9	28.4	28.5
Moulding and extrusion compounds	19.1	20.0	20.5	22.0
Total	43.0	47.0	48.9	50.5
3. *Casein plastics*	2.1	2.7	2.7	1.7
4. *Phenolics and cresylics* :				
Straight resins ...	12.8	12.5	11.4	10.8
Modified resins ...	5.3	6.0	5.8	5.9
Solutions, etc.... ...	1.7	1.7	2.2	3.1
Moulding and extrusion compounds	27.6	31.2	25.9	26.4
Decorative laminated sheet...	14.7	19.8	7.7	8.1
Other laminated sheet			8.3	9.2
Cast sheet, etc. ...			3.2	3.2
Total	62.1	71.2	64.6	66.7
5. *Polyesters*	0.4	0.9	2.2	3.2
6. Other thermosetting materials	1 9	2.5	3.5	4.7
Total thermosetting materials	143.1	160.0	161.4	170.2
THERMOPLASTIC MATERIALS				
7. *Cellulose plastics* :				
Moulding and extrusion compounds	6.7	6.6	6.2	6.8
Others	4.5	5.3	5.2	5.5
Total	11.2	11.9	11.4	12.3
8. *Polyvinyl chloride* :				
Solutions, etc.... ...	2.0	1.6	1.2	1.8
Moulding and extrusion compounds	26.6	27.8	26.8	35.6
Plasticized sheet ...	12.9	17.5	16.0	25.0
Unplasticized sheet ...			2.2	1.9
Rod, tube and shapes...			1.0	2.0
Total	41.5	46.9	47.2	66.2
9. *Polystyrene* :				
Moulding and extrusion compounds	20.9	20.6	22.9	28.9
Other	0.5	0.7	1.0	2.2
Total	21.4	21.3	23.8	31.1
10. *Polyvinyl acetate* ...	55.6	76.4	11.0	12.5
11. *Other thermoplastic materials*			82.8	100.9
Total thermoplastic materials	129.7	156.4	176.2	223.0
GRAND TOTAL	272.9	316.5	337.6	393.1

Golf Results.—The results of the meeting of the P.I.G.S. held at Sunningdale Golf Club on May 15 were: "F. A. Hughes" Trophy: Won by C. Parkinson; runner-up: P. Smith. "Styrene" Silver Salvers: Won by F. T. Fletcher and D. Sullivan; runners-up: J. Corbishley and L. V. Waeland.

Lubricant.—A colloidal graphite compound, Graphogen, manufactured by Stamgo Manufacturing Co. Ltd., 8 Wood St., Kingston-on-Thames, has been found to be a very effective lubricant for injection machines and moulds, particularly in the heating chamber where the bolts can be more readily removed if they are previously smeared with the lubricant.

Omni (London) Ltd. announce that the Rubber & Asbestos Corporation, for whom they are the sole U.K. distributors, now have available their "Bondmaster" E 389, an adhesive which is specially formulated to bond electroplated conductors to baseboards in special printed circuit constructions.

Rigidex Polyethylene.—The physical properties of the five types of Rigidex polyethylene now being marketed by British Resin Products Ltd., are described in a Technical Information Sheet which has recently been issued. Rigidex is manufactured by a process developed by Phillips Petroleum Co. in America.

The five types of Rigidex are designated in order of increasing melt index as Rigidex Type 2, Type 9, Type 15, Type 35 and Type 50. They have been developed to give optimum results when used for particular purposes: thus Type 2 is recommended for the extrusion of sheet, Type 15 for bottle blowing, and so on. In general, the higher type numbers are easier to process. The lower type numbers have the best mechanical properties.

Copies of Rigidex Technical Information Sheet No. 1 can be obtained from British Resin Products Ltd., Devonshire House, Piccadilly, London, W.1.

Company News

Witco Chemical Company announced in New York the acquisition of the Stearate Department of Sun Chemical Company.

Oil Feed Engineering Company Limited of 18 Denbigh Street, Victoria, London, S.W.1, for many years manufacturers of high pressure flexible hose assemblies, has now become a member of the BTR Group of Companies and will operate as the High Pressure Hose Division of the Group.

Acheson Dispersed Pigments Company, a division of Acheson Industries (Europe) Limited, is now in operation at Dukinfield, Cheshire. A modern factory designed especially for dispersing pigments in resins and plasticizers, it has widened the scope of activities formerly carried out at Slough.

Lacrinoid Products Ltd.—The report of the Directors for the year ended December 31, 1957, showed a net profit before taxation of £17,007 this compares with a figure of £27,445 for 1956. The chairman in his statement, however, reported that the turnover for the year was a record. A dividend of 5% has been recommended.

John Dale Ltd. report the net profit for 1957 after deduction of minority interest in Canadian subsidiaries was £300,946 compared with £254,679 in the previous year. A final dividend of 15% was recommended making a total of 25% for the year.

Goshawk Shipyards Ltd. have moved their offices to Bourne House, St. Mary Bourne, Nr. Andover, Hants.

The British Xylonite Co., Ltd., report a group profit before tax of £1,090,557 as compared to £743,855 for 1956. A final dividend of 10% is recommended making a total for the year of 13%.

Wallington, Weston & Co., Ltd., Frome—now one of the Marley Group of Companies—have opened a new office, showroom and stockroom, at 115 Gunnersbury Lane, London, W.3 (telephone Acorn 7011/2).

Mica and Micanite Supplies Ltd., Mica House, Barnsbury Square, London, N.1, are now in full production of the complete range of synthetic-resin-bonded glass fibre laminates formerly produced by Ashdowns Ltd., including Silicone (Grades G.5 and G.9), Phenolic (Grade G.20), Melamine (Grade G.30), Epoxy (Grade G.40), and Polyester Bases. These materials are still being marketed under the trade mark "Ashlam" which is now the property of this Company. In addition, of course, they are also producing the full range of Glass Fibre Laminates, including Sheet, Rod, Tube and Sections marketed under their trade mark "Lamalac."

B. Elliott (Machinery) Ltd. have appointed Wickman Ltd. sole distributors in U.K. and Eire for their Victoria Victomatic 0–18 and 2–30 automatic cycle milling machines.

C.O.I.—The address of The Central Office of Information is now Hercules Road, Westminster Bridge Road, London, S.E.1.

G. V. Planer Ltd.—An American Associate Company, G. V. Planer, Inc., has been formed in New York to pursue the activities in the U.S.A. of G. V. Planer Ltd., Windmill Road, Sunbury-on-Thames, Middlesex, in regard to research services in electrical materials and components.

Union Carbide Corporation recently announced that it will continue with the expansion of its production facilities, as planned, and will spend in the neighbourhood of U.S. $150 million on new construction. During 1958, Union Carbide will again expand its plants and equipment for the production of chemicals and plastics, and expenditure also will be required to meet the increasing demand in certain other fast-growing product lines.

Continental Can Company Inc., of New York, and **Vacuum Research (Cambridge) Ltd.,** of England, have formed a company **Vacuum Metallizing Processes Ltd.,** registered in England, for the purpose of promoting and licensing in all territories outside North and South America their jointly developed and patented process for the metallizing in vacuum of plastic films and paper, on a commercial basis.

Metal Industries Ltd. announces that on May 31 next, two of its wholly owned engineering subsidiaries, Fawcett Preston & Co., Ltd., of Bromborough, Cheshire, and Finney Presses Ltd., of Birmingham, are to be merged. The combined company will be known as Fawcett Preston & Co., Ltd. (incorporating Finney Presses). Manufacture is to be concentrated at Bromborough, and the Birmingham works will eventually be closed. The joint selling organisation of the two companies, Fawcett-Finney Ltd., is to cease operations, and in future sales will be handled by Fawcett Preston & Co., Ltd.

British Cellophane Ltd. are moving into new London offices on July 14. Their address will be Henrietta House, 9 Henrietta Place, London, W.1. (Telephone: Museum 8311.)

Catalin Ltd.—The Directors of Catalin Ltd. announce that the group net profit for 1957 was £17,469 (£15,031) after tax of £18,231 (£12,861). With the balance brought forward of £7,802 there was available £25,271 (£24,720). After placing £10,000 to General Reserve, leaving £15,271, the Directors recommend a payment of 7½% dividend, less income tax, leaving to be carried forward £6,624.

John Dale Ltd.—The Directors of John Dale Ltd. announce that consent of Her Majesty's Treasury has been received to the proposed Issue by way of capitalisation of Reserves of one new Ordinary Share of 5/- for every two shares held at the close of business on May 14, 1958.

Mr. N. Rolaston.

Mr. B. J. Rees.

Mr. A. E. Curtis.

Mr. N. C. Hodson.

Novadel Ltd. announce that their telephone number as from June 23 will be Vandyke 7761–5.

Spicers Ltd.—The British selling rights of " Netlon " for packaging and allied fields have been acquired by Spicers Ltd., 19 New Bridge Street, London, E.C.4, from the manufacturers, Blackburn Pioneer Mill Ltd., of Blackburn. " Netlon " is made of thermoplastic materials by a special process in which the filaments are fused instead of woven. (See *Plastics*, Jan., 1958, p. 5.)

Steele & Cowlishaw Ltd. announce an amalgamation of interests between Baker Perkins Ltd., of Peterborough, and their company.

Following the reconstruction of the Board of Directors, Mr. A. I. Baker (the Chairman of Baker Perkins Ltd.) will be the Chairman of Steele & Cowlishaw Ltd., Mr. F. Limb will continue as the Managing Director of the Company, and additional Directors will be Mr. J. M. Peake (a Director of Baker Perkins Ltd., and Manager of their Chemical Division), and Mr. H. S. Hargreaves (the Deputy Managing Director of Baker Perkins (Exports) Ltd.).

Mr. John Capey, the present General Manager of the Company, will remain in this role as a member of the Board and all existing Works and Technical Staff at Hanley, together with the Regional Technical Representatives, will continue unchanged.

The Baxenden Chemical Co., Ltd., of Paragon Works, Baxenden, Accrington, Lancs., announce that they have been appointed sole distributors in the United Kingdom and Europe for urethane foam mixing equipment manufactured by the Newton Tool & Manufacturing Co. of Wenonah, New Jersey, U.S.A. Actual sales in the United Kingdom will be carried out for the Baxenden Chemical Co. by the parent company, Brown & Forth Ltd., Clifton House, 83-117 Euston Road, London, N.W.1.

John Dale Ltd. have completed an agreement for the purchase of the whole of the issued share capital of Impact Extrusions Ltd. It is intended to maintain the present management, which is under the direction of the Chairman, Mr. O. J. Bruun, and the Managing Director, Mr. H. K. Jorgensen.

Personal

Mr. E. W. Tandy.—Messrs. J. Day & Co. (Derby Works), Ltd., manufacturers of Davu wires and cables have appointed Mr. E. W. Tandy a Director of the Company.

Mr. N. Rolaston has been appointed Director of B.I.P. Tools Ltd. Mr. Rolaston joined the Streetly Manufacturing Co., Ltd., as a draughtsman in 1935, working there until the establishment of the Tyburn Road tool factory, which was formed into B.I.P. Tools Ltd., in 1945.

He became Chief Draughtsman at B.I.P. Tools Ltd. and was subsequently transferred to Development Engineer as the company increased its production.

Mr. R. L. Elkington, C.B.E., Controller of the Export Licensing Branch, retired on May 25, 1958. **Mr. R. Wood** has been appointed Controller as from that date.

Mr. B. J. Rees.—Saro Laminated Wood Products Ltd. are pleased to announce the appointment of Mr. B. J. Rees as Export Manager for the Company's products. This new post has been created to deal with the increasing volume of business overseas. Mr. Rees will be responsible not only for the sale of Saroy, but the Company's other plastic and timber products in the many countries where Saro have Agents or Representatives.

Mr. L. W. Anderson, until recently Chief Project Engineer with Miles Structural Plastics Ltd., has now been appointed Chief Project Engineer at Wemyss Woodhouse Ltd., and will be responsible for the technical management of the rapidly expanding contracts and other industrial developments in their new and enlarged factory specially designed and built for the manufacture of reinforced plastics.

Mr. A. E. Curtis and **Mr. N. C. Hodson** have been appointed directors of Aldridge Plastics Ltd., a subsidiary of Siemens Edison Swan Ltd. They are respectively works manager and London sales manager.

Mr. R. C. Hesketh-Jones, LL.B., who was formerly Sales Director (Industrial Division) of British Oxygen Gases Ltd., has been appointed Chief Executive (Overseas) at the Head Office of The British Oxygen Company. In this capacity he will handle the overseas affairs of the Group in direct association with the Managing Director, Mr. T. E. Potts. **Mr. R. J. Foster,** D.F.C., A.F.C., M.A., who has recently been Director and General Manager of British Oxygen Aro Equipment Ltd., succeeds Mr. Hesketh-Jones.

Mr. R. H. Collis has retired from the Board of Shawinigan, Ltd. **Mr. F. G. Pentecost,** who has been a Director of Shawinigan, Ltd., since 1953, is appointed Chairman. **Mr. V. P. Brooks** has been appointed a Director.

Thomas F. W. Jackson has been appointed Chairman and Managing Director of Union Carbide Ltd. in succession to W. B. H. Gallwey, who died last December.

In taking over Union Carbide Ltd. in this country, Mr. Jackson heads a producing and marketing organisation which is fast becoming a major force in British industry. U.C.L.'s various divisions handle ferro alloys and electro metallurgical products, chemicals, barium getters and valve components. The Company is also concerned in polyethylene production with the new £4 million polyethylene producing unit at Grangemouth, Scotland, and also with the construction of a major Petrochemicals plant which is to be built at Fawley at a cost of £4 million. This latter unit is expected to be in production next year.

Mr. Jackson is also a Director of Union Carbide's affiliated companies Gemec Ltd. (Chairman and Managing), Bakelite Ltd. and British Acheson Electrodes Ltd.

Mr. E. K. Cole (right), chairman of Ekco Plastics Ltd., congratulates Mr. M. O. Rowlands the designer of the polythene baby bath which received a " Design of the Year " award.

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Experience has shown there is no substitute for a Sebacate.

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THE GEIGY COMPANY LTD
Plastics Chemicals Division, Rhodes, Manchester

P.45

THEY'RE LIVELY LADS AT LORIVAL

For long-running, mass-production plastic mouldings
in any material, it certainly pays
to 'leave it to Lorival'

LORIVAL PLASTICS · UNITED EBONITE & LORIVAL LTD · LITTLE LEVER · NR BOLTON · LANCS

L97

Automation Equipment

Auto-manual Speed Drive.—A new Sextet auto-manual speed drive is now being marketed by Industrial Drives Ltd. This new model utilizes the well-known differential pulley principle of a manually-operated variable speed pulley—usually the driver—transmitting by means of a Vee belt to an automatic variable speed pulley—usually the driven member. They each provide an infinitely stepless speed variation of 3.6:1 ratio, resulting in an overall speed variation of up to 12:1 ratio. This 12:1 ratio is divided equally above and below driver speed. For example, from a constant 1,000 r.p.m. driver (motor) input speed, the final speeds available on the driver shaft would be 3,600 r.p.m. maximum down to 400 r.p.m. minimum.

The new manual V.S. pulley incorporates several interesting features including a hand-wheel made of light aluminium alloy. The handwheel, which forms part of the pulley assembly, is easy to grip and operate.

Another interesting feature is the angular contact ball races which are fitted to the assembly and allow for a thrust as well as a radial loading.

The component parts of the unit receive a pre-lubrication treatment before assembly, giving ease of movement to all sliding faces and to the ball races, and preventing scuffing of the mating surfaces during early life.

The unit is fitted with circlips which reduce the length of various parts and help to produce a neat, compact drive assembly.

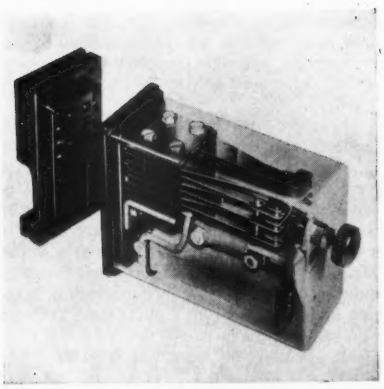
The automatic spring loaded pulley, which usually occupies the driver position has been improved by special treatment against fretting corrosion. In this case, also, the surfaces are pre-lubricated. It incorporates side spring loading via six separate springs—a feature of all Sextet V.S. pulleys—thus providing a simple and positive method of adjusting the side pressure on the belt to suit any particular application.

The Sextet auto-manual variable speed drive is capable of converting any sychronous speed motor to give an infinitely variable speed drive up to a ratio of 12:1. It is available for h.p. ratings from fractional to 5 h.p. The units are mounted on fixed shaft centres and are easy to install.

Industrial Drives Ltd., 44 Uxbridge Road, Ealing, London, W.5.

Miniature Plug-in Relay System.—This is a completely new range of components including plug-in multi contact relays with transparent covers, special socket bases, and socket mounting frames. They are similar in design to those employed in the standard C. & S. plug-in relay system, but the size has been scaled down so that each relay is little bigger than the 3000 type.

The photograph shows a typical relay, which can be supplied for operation from either A.C. or D.C. The contacts are rated at 2 amps.



Miniature plug-in relay.

at 25 volts and each only requires about 1¼ in. × 2½ in. of panel space.

D. Robinson & Co., 58 Oaks Avenue, Worcester Park, Surrey.

Cathode Ray Polarograph.—A very high degree of sensitivity is obtainable with this instrument which gives full scale measurements down to 2.0×10^{-8} amps. corresponding to concentrations of fractions of a microgram per millilitre.

For resolution ions differing only by 0.1 volt in their half-wave potential may be easily resolved when present in solution. A switch brings in the derivative circuit which is particularly useful for trace element measurements in the presence of large preceding reductions, and for resolving elements as close as 0.03 volts in half-wave potential.

The peak heights of the waves produced are strictly proportional to the concentrations of the particular elements present, and may be read off directly from the graticule on the tube face. The entire polarographic scale may be quickly investigated over the range +0.5 to 2.5 volts when dealing with unknown solutions. The polarogram is produced within seconds of placing the solution under the dropping mercury electrode, immediately disclosing the presence of any element reducing in that section of the polarographic scale to which the controls are set.

Southern Instruments Computer Division, Camberley, Surrey.

Universal Bridge applied to Chemical Measurements.—A range of special adaptors has been designed which make use of the three terminal facility and exceptional discrimination of the Wayne Kerr Universal Bridge to cover a wide range of chemical measurements which can readily be applied to process and quality control.

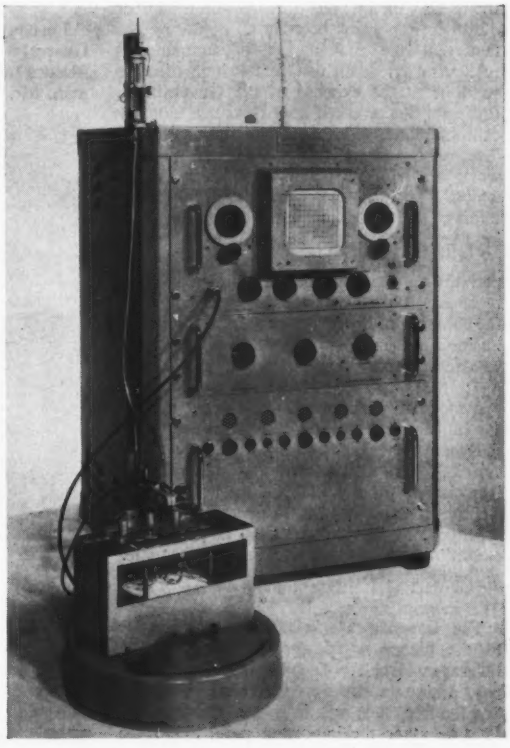
An important feature of this method is the ability to make measurements with non-contacting electrodes. As the adaptors can be employed at a considerable distance from the bridge, the examination of flowing liquids is simply achieved.

The special cells and adaptors have been designed to cover a wide range of measurement of conductivity, permittivity and loss factor of solids and liquids.

The bridge is most suitable for highly accurate conductivity measurements using conventional two-terminal cells having platinum electrodes immersed in the solution under test. A range of cells with non-contacting electrodes has also been designed. The use of such cells is only possible with a bridge having three-terminal facilities.

A series of capacitive-coupling cells with non-contacting electrodes and a range of capacitive-coupling cells for the determination of permittivity and loss factor of liquids are available.

Wayne Kerr Laboratories Ltd., Chessington, Surrey.



Cathode Ray Polarograph of high sensitivity.

TALKING SHOP . . .

Open Days at Shawbury. From May 6 to May 9 the laboratories of the Research Association of British Rubber Manufacturers were open to visitors, special demonstrations and exhibits having been arranged. Two lectures were given, one on May 7 by Dr. R. J. W. Reynolds, Associate Research Manager of the Dyestuffs Division of the I.C.I., who spoke on developments in condensation polymers, and the second by Mr. W. Rogers, of the D.S.I.R., on work simplification of the research associations. On May 5 a dinner was held in Shrewsbury at which the chair was taken by Mr. D. B. Collett, Chairman of the Council of the RABRM. The President, Mr. P. W. Howard, proposed the toast of the guests and reviewed the work of the Association, underlining the importance of close co-operation between the Association and individual companies in the rubber and plastics industries.

The focus of the Association has shifted substantially during the past five years. From being an organization solely concerned with natural rubber, it has systematically set out to woo the plastics industry, to bring within the framework of its activities the full range of truly synthetic materials. This was not only underlined by Mr. Howard in his speech but was also self-evident from the 12 individual exhibits arranged at the laboratories. Whilst it is true to say that the main activities of the Association are directed towards the *rubberlike* plastics, I would not be surprised if the field were to be extended to embrace all plastics materials whether or not they exhibit certain characteristics comparable with rubber.

The response to Mr. Howard's address was given by Professor M. Stacey, of Birmingham University, who re-stated in considerable deal the thesis which he has presented on a number of other important occasions. Bewailing the fact that the major part of fundamental research carried out in Great Britain today is so done at the expense of the Government, Professor Stacey asked why it was that industry exhibited such little interest in this important facet on our technical life. He cited his own work on fluorine polymers at Birmingham which, whilst showing very interesting possibilities, had received scant attention from industry.

The occasion of the RABRM dinner was perhaps an apposite one for Professor Stacey to speak. Both he and the Association have the common problem of securing the interest of businessmen in fundamental and technological research. The moral, I suggest, is an obvious one; the work at Shawbury has already provided new techniques and thus new markets for rubbers and plastics. Whatever the future may hold for these two industries, they would certainly be most foolish not to encourage the Association and organizations of similar character, since they are in effect providing a "hedge" against any possible adverse trade conditions which we may expect to encounter in the reasonably near future.

* * *

The Common Market. Immediately prior to the dinner noted above, Mr. T. C. N. Belgraver, of the T.N.O. Organization, Holland, gave a short address on the common market and the free trade area in rubber manufacture. In it he made the important point that these two separate proposals constitute, in effect, a reversion to the situation in Europe which obtained before the 1914 War. The free trade area, as it then was, was so maintained by free competition, a flexible economic structure and, above all, the universally accepted gold standard.

These pre-1914 instruments are no longer feasible, and alternative methods of maintaining a common market and/or free trade area have to be found. This in fact will be achieved by the elimination of tariffs between the contracting countries and by the erection of a tariff wall around the territories as a whole. Mr. Belgraver suggested that the British rubber industry could only gain by participating in the free trade area both on a direct basis and also as a result of the increased flow of goods from Great Britain to countries abroad. Mr. Belgraver's comments have special value in that a miniature free trade area has been in effect for some years in respect of Belgium, Holland and Luxembourg. Within broad limits the system has been found to work extremely well notwithstanding the tremendous wealth of Belgium, which is still in possession of the Congo, by comparison with the extremely difficult period through which Holland has gone following 1948, as a result of losing the Dutch East Indies.

* * *

The New Diakons. With reference to our editorial on the above subject in the April issue of *Plastics*, Richard Daleman Ltd. suggest that the note infers that few, if any, companies, did in fact extrude the old type of Diakons prior to the advent of new materials. This was not our intention since Richard Daleman Ltd. were in fact extruding in 1955 the grades of Diakon then available.

* * *

London Section Elections. At the Annual General Meeting of the London Section of the Plastics Institute on May 6, the retiring Chairman, Mr. C. W. Welch, delivered the Annual Report, in the course of which he noted the substantial increase in membership of the Section. He also paid tribute to all who had contributed to the success of the year under review including members of the London Section Committee and the speakers who had delivered the technical papers. He made special mention of the contributions by Dr. P. L. Clegg, Mr. E. Gaspar, and Dr. O. F. Bartoo. He also thanked the Honorary Secretary of the Section, Mr. Charles Oakhill, for his untiring efforts on behalf of the Section.

Mr. D. S. Mahon, new Chairman, London Section.

Mr. Dennis Mahon was elected Chairman for the session 1958/59, Mr. C. W. Oakhill was elected Honorary Secretary, and the results of the ballot for the three vacant positions on the Committee were announced. Elected were: Mr. J. M. Lassen, Dr. F. P. Hiron and Mr. M. Kaufman.

The A.G.M. was followed by a paper delivered by Dr. N. J. L. Megson, head of the Chemistry Department, R.A.E., Farnborough, on modern ideas on polymer formation and degradation. This constituted a brilliant survey of the new concepts which have emerged in recent years and will be published in full in a forthcoming issue of the Institute's transactions.

* * *

Russian Developments. Statements by Russian leaders in recent weeks indicate that a big expansion is to take place in the Soviet chemical and plastics industries. The *Financial Times* on May 16 reported Mr. Kruschev's statements to the Communist Party's Central Committee in which he said that more than 100,000 million roubles would be allocated for rebuilding and reconstructing 257 chemical enterprises in the Soviet Union. Between 1958/65 production of synthetic fibres is scheduled to increase four and a half times, plastics eight times and synthetic rubber three and a half times. He said that the country had all the necessary resources and announced that Russia would make a strong bid for an expansion of trade with the West. He also said that it would be expedient for Russia to place orders for certain equipment with the U.S.A., West Germany and Britain, to implement this vast expansion.

Readers of this column will remember the visit paid to Russia a year or two ago by three members of the British plastics industry; in their report on their return they took the view that in Russia there existed a considerable market for the products of our industry. Mr. Kruschev's statement underlines this obvious point, and it will be interesting to see what steps U.K. companies take to put themselves in contact with the Soviet bloc.

* * *

The Toxicity of P.T.F.E. A story has been told throughout the world that p.t.f.e. (polytetrafluoroethylene) was responsible for the death of a man who smoked a cigarette while working with this material. Exhaustive inquiries both by the Ministry of Supply and the appropriate Governmental bodies in the U.S.A. have failed to confirm that such a death has occurred.

P.t.f.e. is an inert non-toxic material, but if it is over-heated above 350° C. toxic fumes are liable to be released due to the decomposition of the polymer. The time for which the material is heated naturally determines the quantity of decomposition products. Thus fumes may arise from sintering or machining, but their inhalation can easily be prevented by the application of local exhaust ventilation applied as near as possible to the source.

The most serious hazard in working with p.t.f.e. arises from its decomposition on burning tobacco as the decomposition products are liable to be inhaled. For this reason, smoking should not be permitted in workshops where p.t.f.e. is processed.

PLASTIKON.

Vertical Feed Dicing Machine

Details of the new Burtonwood dicing machine which is now fitted with a vertical feed.

IN the March, 1957, issue of *Plastics* we published a detailed description of the Cumberland Stair-Step dicing machine manufactured by Burtonwood Engineering Co., Ltd. This machine has been a considerable success and today we are pleased to give a description of a new machine of this type, built by the same company, which incorporates several modifications.

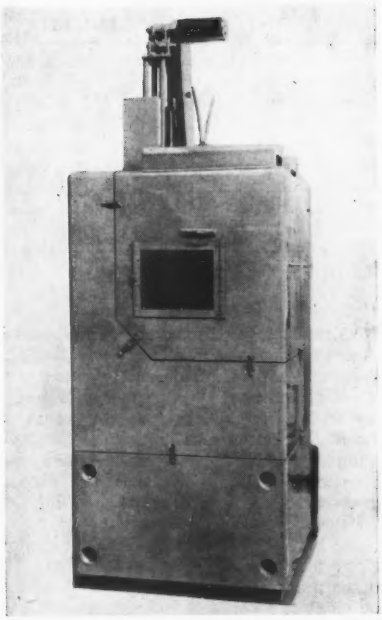
The Vertical Feed Dicer

Like the horizontal feed machine the vertical feed dicer uses the stair-step method of cutting. In this system the sheet stock is fed at a predetermined speed against rotating knives which because of their toothed profile dice the sheet. By varying the speed of the feed the size of the cut can be controlled and thus the size of the pellet.

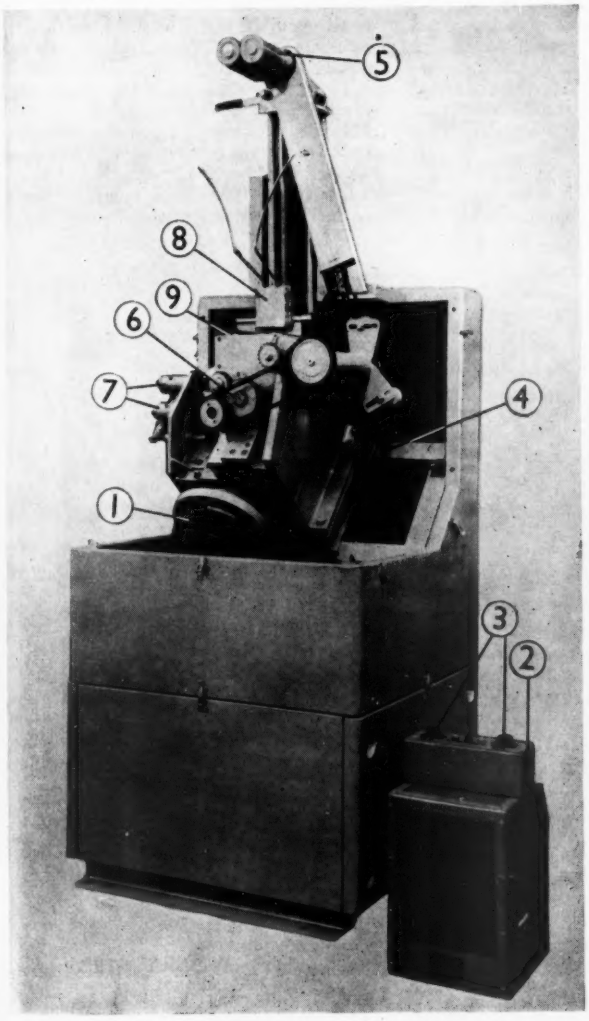
The rotor, upon which the knives are mounted, is driven directly by vee belts (1) from 20 h.p. electric motor housed in the base of the machine. The knives of which there are eight, are of hardened high carbon tool steel and are accessible through a door in the rotor housing where they can be adjusted to the bed knife. The bed knife itself has twice as many teeth as any one of the rotor knives so that when cutting, alternate knives repeat the same cut. Adjustment of the rotor knives is by set screws at the back and ends.

Feed Roll Assembly

So far this machine does not differ from the horizontal feed dicer but in the stock feeding mechanism several modifications have been made. The first of these and probably the most important is the separate drive which is now incorporated for this mechanism. Instead of driving by sprocket and chain from the rotor itself a separate ½ h.p. English Electric Magamp motor control unit is employed. This unit provides a stepless variation of speed of the motor over a 30 : 1 speed range and when a required speed has been set it remains constant within specified limits (2%) irrespective of the load. The Magamp control unit (2) which is bi-directional is separate from the motor and has three push-button switches (stop, forward and reverse), and two speed controllers (3) for forward and reverse movement. A transductor is used in place of valves in the controller and thus no warming-up period is necessary. The motor itself is mounted on the main frame of the dicer and is connected directly to a 7½ : 1 reduction unit. A sprocket and chain drive (4) transmits the torque to the feed roll (5) and to the urger rolls (6). These urger rolls are serrated and placed adjacent to the bed knife. The material is held on to them by spring loaded pressure rolls and fingers (7). Between the feed rolls and the rotor housing a safety trip (8) can be fitted so that should the feed stock be obstructed in its passage to the rotor the resultant looping of the material will touch the arms of the trip and automatically stop the machine.



The vertical feed dicing machine with panels in place.



The vertical feed dicer with soundproof panelling removed.

1. Vee belt drive.
2. Magamp motor control unit.
3. Speed controllers.
4. Feed motor transmission.
5. Feed rolls.
6. Urger rolls.
7. Presser fingers.
8. Safety trip.

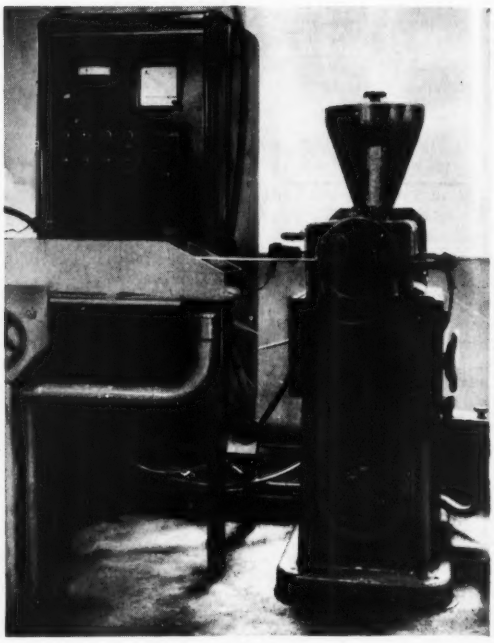
All rotating parts of the dicer are supported on ball or roller bearings particular attention being given to the rotor bearings which are of single and duplex type. The whole dicer is enclosed in special panelling which effectively reduces the noise of the machine. The panels, as can be seen from the illustrations, are quickly and easily detached giving ready access to all parts of the mechanism.

The principal advantage of the vertical feed over the horizontal feed is its ability to handle warmer or softer material. With a horizontal feed table using soft materials, a considerable amount of table drag or frictional resistance was encountered which interfered with the feed rate. With the vertical feed this has been overcome and in addition the redesigned feed mechanism has facilitated both the pellet size control and size changeover both of which are controlled by the rate of feed within ranges dictated by the knife size. By changing the knives up to ½ in. pellets can be produced. The machine illustrated is the 7-in. dicer but other models including a 3½-in. are being manufactured and it is expected that they will be shown at the Chemical and Petroleum Engineering Exhibition at Olympia from June 18 to June 28.

Machines for the Industry

Barand 1½ Inch Extruder

A detailed report on this general-purpose machine.



(Right) The extruder in operation, covering wire with p.v.c.

TO meet the need for a small, inexpensive, general-purpose machine, Barand Ltd., Cordwallis Works, Maidenhead, Berks., have recently introduced a 1½ in. extruder, embodying design features which are the result of considerable experience in this field. These features include simplicity of operation and maintenance, exceptionally high output, robustness and longevity and flexibility of installation.

The base of the machine is a rigid casting which houses a constant speed 5 h.p. (1) motor running at 1,400 revs./min. Drive to the screw is through a self contained FUV.4 variable speed gearbox (2) giving speed ratio of 6:1.

This gearbox is a friction drive the principle of operation being dependent upon the variation in position of an intermediate roller (3), relative to the axis of a driving (4) and driven (5) plate between which it lies. An automatic pressure device (6) is fitted in the output shaft which varies the contact pressure between roller and plates in direct proportion to the load. Discs and rollers are made from a special high percentage chrome steel and are carefully heat treated and ground. Oil level and speed indicators are provided and speed is adjusted by means of an external handwheel (7).

From the F.U. unit, the drive is taken via a coupling (8) and integral gear box (9), consisting of a double helical gear train which provides at the screw, a speed range of 16–100 rev./min. The initial drive from the motor to the F.U. unit is by means of four vee belts (10), the tension being readily adjusted by lowering the motor on its hinged mounting plate.

The thrust of the screw (11) is taken by taper roller bearings (12) of ample capacity which together with the helical gear train are lubricated by a positive feed circulating system embodying a filter (13). A sight glass in the sump enables the level to be readily checked.

The screw, which is bored throughout its length for water cooling (14), is machined from high tensile alloy steel, the flights being hard chrome plated, and ground and polished. Later models feature nitrided steel screws which dispense with the necessity for hard chrome plating.

The standard screw has a length/dia. ratio of 16:1 the helix being of constant pitch and variable depth, giving a compression ratio of approx. 2.4:1 and is suitable for extruding polyethylene and p.v.c.

Special screws can be supplied to customers' requirements and it is a feature of the machine that the screws can be changed in a matter of minutes using the extractor (15) provided and without removing the barrel or disturbing the bearings thus making it an ideal machine for research and development on compound evaluation, etc.

The barrel (16) is of steel having a hardened steel liner (17) which can be replaced in the event of wear taking place. Liners are locked by means of dog-point screws and located length-wise by a screwed ring (18) in the barrel nose. An adaptor plate (19) is bolted to the nose of the extruder and the die head is bolted to a similar plate the two being hinged together on a removable pin (optional), permitting access to the breaker plate (20) and withdrawal of the screw when necessary. When extruding, the plates are clamped together by means of a tapered split clamp ring (21) fitted with socket head screws.

Barrel heating is by means of six 800 W cuff type elements (22) arranged in three zones, each controlled by a Tem-Con controller (23) located upon the barrel itself. These instruments are bi-metallic expansion operated switches, used in conjunction with Tem-Con electronic relays and are capable of operating on temperature changes of plus or minus 0.1° C., the setting being adjusted by means of a knob fitted with a pointer moving over a scale graduated from 0–10.

All wiring on the machine is protected in a box section steel harness (24) fitted with

A general view of the extruder and the control cabinet.

detachable inspection plate and a readily removable asbestos-lined stainless steel cover (25), surrounds the barrel when the machine is in operation.

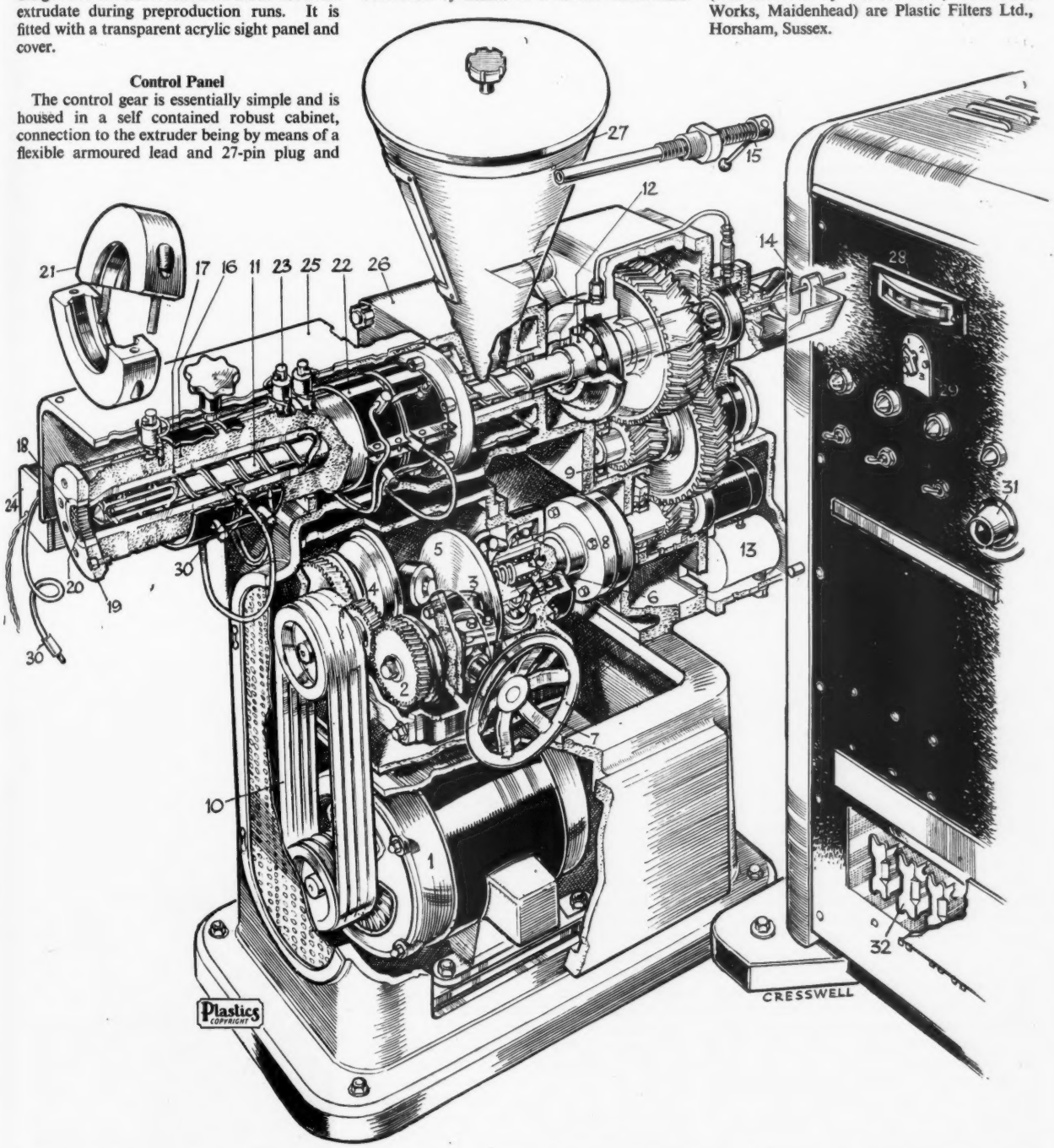
The feed casting (26) is cored for water cooling and a gap is provided between the main bearing and the casting itself to prevent contamination of the material with oil, in the event of an oil seal breakdown. The hopper (27) is located in the taper in the feed casting and is designed to lift out to facilitate the re-use of an extrudate during preproduction runs. It is fitted with a transparent acrylic sight panel and cover.

Control Panel

The control gear is essentially simple and is housed in a self contained robust cabinet, connection to the extruder being by means of a flexible armoured lead and 27-pin plug and socket. With a similar arrangement between cabinet and the supply main, flexibility of installation and portability are assured. The back and sides of the cabinet are hinged for easy accessibility.

The control gear consists of a P.A.M. amplifier, a pyrometer (28) and a multi-position switch (29), the operation of which permits the thermocouples (30) in each zone to be connected to the pyrometer in turn. Die heating is controlled by means of a Sunvic Simmerstat (31) and a thermocouple is also fitted at this point. An ammeter is provided to indicate the load on the motor and warning lights on the panel follow the operation of heating elements. Fuses (32) are located at the base of the cabinet and are protected from the ingress of dirt by a readily detachable acrylic panel. A master switch (not seen in drawing) is provided on the panel for complete isolation of the equipment.

The sole agents for the "Barand" extruder (manufactured by Barand Ltd., Cordwallis Works, Maidenhead) are Plastic Filters Ltd., Horsham, Sussex.



BARAND EXTRUDER—Key to Drawing above. 1—Motor; 2—Gearbox; 3—Intermediate roller; 4—Driving plate; 5—Driven plate; 6—Pressure device; 7—Speed control; 8—Coupling; 9—Integral gearbox; 10—Drive belt; 11—Screw; 12—Bearings; 13—Filter; 14—Water cooling; 15—Extractor; 16—Barrel; 17—Liner; 18—Ring; 19—Adaptor plate; 20—Breaker plate; 21—Clampring; 22—Heating elements; 23—Controller; 24—Harness; 25—Cover; 26—Feed casting; 27—Hopper; 28—Pyrometer; 29—Switch; 30—Thermocouples; 31—Die heating control; 32—Fuses.

Bonding Polyethylene to Rubber, Brass and Brass Plated Metals

By H. PETERS and W. H. LOCKWOOD †

POLYETHYLENE has in a very short time become one of the most widely used plastics. One difficulty which has limited its use in certain applications is the problem of suitably joining polyethylene to other materials, particularly to rubber and to metals. At least one method has been described in the literature (11) which is alleged to give a good bond between polyethylene and metal but so far this method has not come into wide use. In joining polyethylene to rubbers, one of the most effective methods has been the fabrication of a graded seal (8). This was first used in the repeater housing of the 1950 Key-West, Havana Telephone Cable, and consists of bonding a vulcanizable natural rubber to a brass bushing and in turn bonding the rubber to the polyethylene insulation using four intermediate layers of polyethylene-natural rubber mixtures of graded compositions (Fig. 1). Such graded compositions and the vulcanizable rubber can now be eliminated and the polyethylene bonded to the brass with a new bonding material (Fig. 1).

Bonding polyethylene to rubber, brass or brass-plated metals is now possible through the use of a cement based on partially hydrogenated polybutadiene (8% unsaturation), known as "Hydropol" (5), made by the Phillips Petroleum Company, Bartlesville, Oklahoma. This polymer, compounded with vulcanizing ingredients, is inserted between polyethylene and a vulcanizable rubber, or between polyethylene and brass, in the form of a thin film. Application of heat and pressure produces a strong vulcanized bond.*

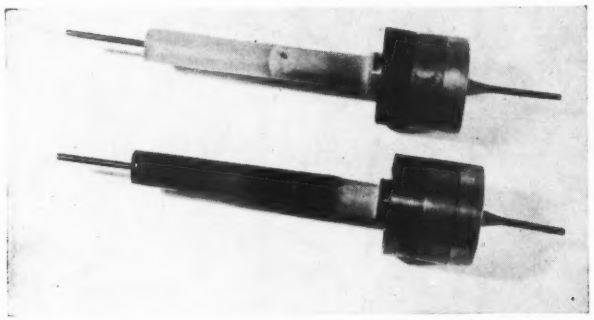


Fig. 1. Direct bonding of polyethylene to brass compared to the graded seal method.

Polybutadiene has the approximate structure $\ldots CH_2{-}CH = CH{-}CH_2 - (CH_2{-}CH = CH{-}CH_2)_n - CH_2 \ldots$ where n is a large number. This polymer is a rubbery material with little resemblance to polyethylene. However, if the polybutadiene is hydrogenated, it becomes firmer, more waxy and approaches polyethylene in properties and appearance as more of the double bonds present in the polymer are saturated. This similarity in structure causes hydrogenated polybutadiene with 8% unsaturation to heat seal with polyethylene.

The bond between partially hydrogenated polybutadiene and compositions of soft and hard rubber is believed to be formed primarily by vulcanization, involving the double bonds in both molecules. Even a small amount of unsaturation in partially hydrogenated polybutadiene suffices for a strong bond to vulcanizable rubbers. For example, hydrogenated polybutadiene, mixed with enough polyethylene to produce a compound with 3% unsaturation, still gives a satisfactory bond.

Bonding brass to rubber is an old established art. It dates back almost to the discovery of vulcanization by Charles Goodyear. It is not known who first observed this phenomenon; but as early as 1862, Sanderson obtained a British patent (9) on this process. In 1911, Hood (4) adopted the brass plating method for obtaining adhesion between rubber and metal in the production of rubber rollers, although the process was not employed extensively until the middle of 1925.

Theories on this subject are numerous and conflicting. It is generally agreed by most investigators that some of the important variables contributing to the strength of adhesion are as follows: Composition of the rubber compound, vulcanization rates, composition and structure of the brass, methods of cleaning, composition of plating bath, etc. However, no attempt will be made here to comment on the validity of these theories, nor to discuss these variables in any great detail.

Rubber compounds, when vulcanized in contact with brass, develop a bond because of the chemical reaction which apparently occurs between sulphur and rubber on the one hand, and sulphur and the metal constituents of the alloy on the other. Not all rubber compounds give adhesion to brass, and the development of satisfactory formulations constitutes one of the many problems associated with a bonding process. While it is agreed that the fillers (both reinforcing and non-reinforcing), plasticizers, anti-oxidants and other ingredients in the formulation, all may contribute to the bonding, the real crux of the problem rests with the curing system, i.e. sulphur, and especially the accelerator. This is emphasized by Gurney (3). He points out that if the union of sulphur with rubber on the one hand, and with the brass on the other is to proceed simultaneously, the acceleration should not be so fast as to favour the rubber, nor so slow as to permit excessive reaction between sulphur and brass while movement of the still-plastic rubber is possible. He concludes that a medium-speed accelerator is a suitable compromise. McCortney (6) states that small percentages of accelerators are most effective and that a slow rate of vulcanization, or set-up, is essential. He recommends the use of a medium-speed accelerator such as mercaptobenzothiazole and warns against the use of high-speed ultra accelerators.

These observations were also confirmed by Morron (7) who found ultra accelerators produced poor adhesion between brass and rubber.

Experimental Details

The Adhesive Compound

The observation of McCortney (6) that medium-speed accelerators, such as mercaptobenzothiazole, are most desirable for bonding brass to rubber was also observed in our laboratory more than 25 years ago. This same approach was applied to the compounding of partly hydrogenated polybutadiene. It was primarily formulated to obtain adhesion to brass. It is recognized that many other compounds can be formulated for this purpose. The basic formulation is shown in Table I. Except where noted, the formulation with 8% unsaturation was used throughout this investigation.

Compound Mixing and Cement Preparation

Compounds are made on conventional

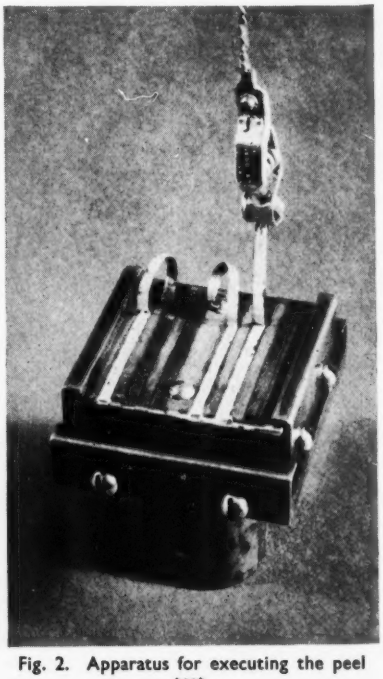


Fig. 2. Apparatus for executing the peel test.

* Bonding by this technique is the subject of U.S. and foreign applications for patent.

† Bell Telephone Laboratories Inc.

mixing rolls. Some sticking is observed but this can be minimized by keeping the rolls cool. The compound does not scorch during the mixing cycle and shelf-ages very well.

TABLE I. BASE FORMULATION

Ingredients	Parts by Weight
Partly Hydrogenated Polybutadiene	100.0
Zinc Oxide	50.0
Petrolatum	5.0
Sulphur	3.0
Trimethyldihydroquinoline	1.0
Stearic Acid	0.5
Mercaptobenzothiazole	0.5

The cement is prepared from a mill mixed compound. Ten grams are dissolved in 100 cc. of toluene, an operation which usually requires 2–3 hours of heating. At room temperature the cement will remain 4–5 hours as a liquid. After that gelling will occur. Re-heating will disperse the gel. This cycle was repeated many times over a period of 30 days without the formation of any permanent gel. The cement is applied with a spray gun. Other satisfactory means of application are brushing and dipping the cement.

Solvents other than toluene can achieve the same purpose. Instead of a milled compound, a dry powder mix of Hydropol crumb and compounding ingredients can be dispersed in a solvent.

Brass Composition

Three-quarter hard brass, 0.004 in. thick and 64.41% copper and 35.47 zinc (no lead), was used in this investigation, with the exception of experiment (Fig. 4). In this case, the same base metal was used for the electrodeposition of various brass deposits. The analyses of these deposits were obtained from steel test samples which were plated simultaneously with the brass sheets. The thickness of the deposit was approximately 0.4 of a mil.

Brass Cleaning

In all cases except one, the brass was degreased at 25° C. with toluene, abraided with fine #280 Aloxite paper and again cleaned with toluene at 25° C. In the case of the exception (Fig. 4) the plated surface was given a 5-second bright acid dip.

Polyethylene

While excellent adhesion can be obtained with high density polyethylene, the low density was used for the systematic part of this investigation.

Free Sulphur

Unreacted or free sulphur is determined in accordance with the sodium sulphur extraction method—ASTM D297–55T.

Preparation of Test Samples for Peel Test

Brass sheet, 2 × 2 × 0.004, cleaned as described, is sprayed with a warm solution of an unvulcanized, vulcanizable, partly hydrogenated polybutadiene. The thickness of the dried film is approximately 0.003 in. This film is placed in contact with a preformed 0.060 in. sheet of polyethylene and vulcanized in a positive pressure mould at 100 p.s.i. for various periods of time at various temperatures. The bonded laminate is removed from a cool mould.

One eighth in. wide adhesive tape is spaced ½ in. apart on the surface of the brass laminate. The exposed brass is coated with a masking agent. The adhesive tapes are removed and the brass beneath is etched away with ferric chloride.

TABLE II. PHYSICAL PROPERTIES

% Unsaturation	8	18	29	55	64	88
*Tensile Strength–p.s.i.	3700	1310	1515	770	500	400
Elongation–%	750	425	400	400	380	490
Hardness-Shore "A"	90	90	81	62	60	44
S–300	950	1150	1100	380	400	250
Brittle Point–°C.	<−70	<−70	<−70	<−70	<−70	<−70
Frequency–KC	1	1	—	—	—	1
Dielectric Constant	2.65	3.13	—	—	—	2.96
Dissipation Factor	0.0027	0.0100	—	—	—	0.0033
Vol. Res. (D-C) ohm-CM	$>1 \times 10^{16}$	$>1 \times 10^{16}$	—	—	—	$>1 \times 10^{16}$
Dielectric Str-60 c.p.s.	1320	880	—	—	—	650

*Vulcanized 60 Min. at 150° C.

Peel Test Method

After etching, test samples are allowed to age three days at 25° C. at 50% humidity before they are tested. As shown in Fig. 2, the test board is mounted in a specially designed clamp which in turn is anchored in the lower jaw of an Instron machine. The edge of the brass strip, which is pried loose with a knife, fits into the upper jaw of the machine. The jaws are separated at a rate of 1 in. per minute at 25° C. Five sample strips are tested in each case and the results are reported in pounds per linear inch. The results are reproducible within ± 10% of the mean.

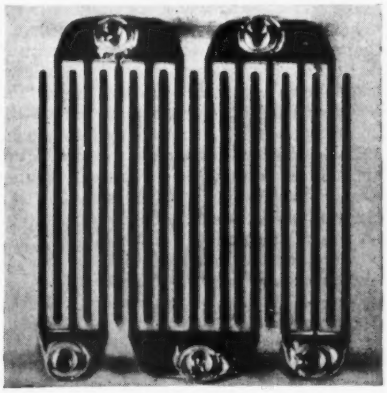


Fig. 3. A circuit test board.

Adhesion in Tension

Except for the thickness of the vulcanizate between the brass buttons, which is ½ in., the test samples are made and evaluated in accordance with ASTM D429, Method A. The results are reported in pounds per square inch.

Experimental Results and Discussion

The properties of the polybutadiene vulcanizates with various degrees of unsaturation are shown in Table II. The physical properties, while somewhat erratic, show clearly that the maximum tensile strength is obtained with the least unsaturation and the hardness and elongation decrease with increased unsaturation. The brittle point (ASTM D746) for all the vulcanized polymers gave low values of less than —70° C.

The electrical properties of these vulcanized hydrocarbons are excellent. The results obtained with the 8% unsaturation are approaching those of polyethylene. In addition, the electrical properties are stable at high humidities. This property makes it attractive as an adhesive for printed circuit boards. For this application brass or brass-plated foil is bonded to high density polyethylene and printed circuit designs are etched in accordance with conventional procedures. Contact lugs are soldered without disrupting the adhesive bond. Fig. 3 represents a typical circuit test board for electrical evaluation.

Success in bonding sulphur-vulcanizable rubbers directly to brass is a function of the copper-zinc ratio, a fact known to most rubber technologists. The results in Fig. 4 substantiate this fact and show that the maximum peel strength is obtained with a brass having a 65/35–75/25 copper-zinc ratio. It is conceivable that this range might shift slightly with a different sulphur-accelerator ratio. Also, it has been observed that essentially the same bond strength is obtained with a 65/35 brass and this same brass plated with 65/35 brass. With brass composition fixed, maximum adhesion is obtained with optimum curing time.

Appearance of the samples shown in Fig. 5 is consistent with the data presented in Fig. 4. Brass with a 70/30 composition produces the best adhesion as judged by the peel strength and by the residual adhesive left on the surface

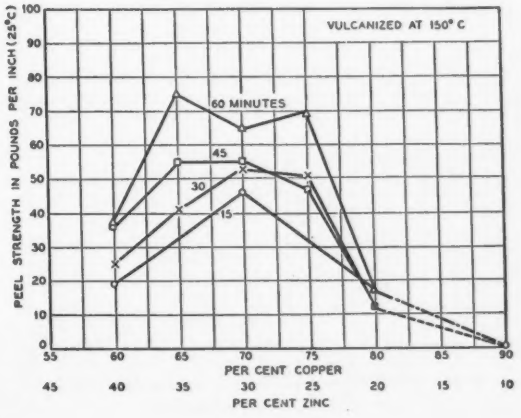


Fig. 4. Effect of the copper-zinc content of brass on the peel strength of polyethylene using a vulcanizing H.P.B. (8%) cement as the bonding medium.

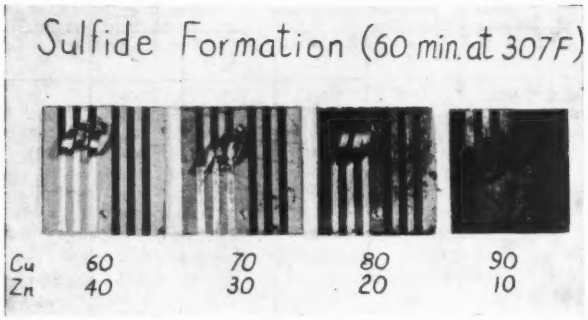


Fig. 5. Sulphide formation versus brass content in actual peel tests.

of the brass and polyethylene. Similar results were obtained with 65/35 and 75/25 brass, but are not shown in the photograph. While it may not be apparent in the print, the discolouration on the brass and the surface of the vulcanized adhesive is different for each composition. The 90/10 sample is black and the 60/40 is almost free of any discolouration. The discolouration suggests the presence of cuprous or cupric sulphide or a mixture of both. This has been confirmed in part by Satake (10) and Buchan (2). However, it has not been firmly established what sulphide or ratio of sulphides produces the best adhesion. Attempts are being made in our Laboratories to obtain information on this question. Information to date indicates the presence of both sulphides along with a small amount of oxide. The oxide could exist as an impurity or it might be significant. If future work proves it to be significant, it would lend considerable weight to the oxidation theory postulated by Blow (1).

Fig. 6 shows the relationship between the sulphur content and the peel strength. One part of the sulphur appears to be the minimum amount required to give maximum adhesion.

Free sulphur determinations were made on the 60-minute vulcanizates. Compounds which originally contained 0.5, 1.0, 2.0 and 3.0 parts by weight per 100 parts of hydrocarbon, gave free sulphur values of 0.03, 0.14, 0.28 and 0.78% respectively. Curing rubbers with the least amount of sulphur is desirable in order to keep the free or uncombined sulphur to a minimum since it can diffuse through polyethylene and possibly produce corrosion with a contacting metal. However, this has not been observed with a free sulphur of 0.14%. It is also interesting to note that the combined sulphur of 0.86% can saturate only 20% of the double bonds in 8% polybutadiene.

Fig. 7 shows the effect of time and temperature on the peel strength of brass-polyethylene laminate bonded with a vulcanized hydrogenated polybutadiene. It is generally recognized that the vulcanization time can be approximately halved with a temperature rise of 10° C. Maximum adhesion is obtained in a period as short as one minute at 232° C. or 3–5 minutes at 204° C. Short cures at an elevated temperature are desirable for bonding polyethylene to wire and cable. However, in cases where maximum adhesion is not required, lower temperatures and corresponding periods of cure produce satisfactory results.

Fig. 8 illustrates the effect of unsaturation of a vulcanizable hydrogenated polybutadiene on the peel strength of brass-polyethylene laminate. As the unsaturation is reduced to 8%, increased adhesion is obtained between brass and polyethylene. On further reduction of the unsaturation to 3%, accomplished by mixing 8% unsaturated polybutadiene with a sufficient amount of polyethylene, a satisfactory but weaker bond is obtained. This observation is based primarily on visual inspection. Compounded polyethylene which has zero unsaturation has a peel strength of 4 p.i. With increased unsaturation the bond to the brass remains strong, but the bond to polyethylene becomes less.

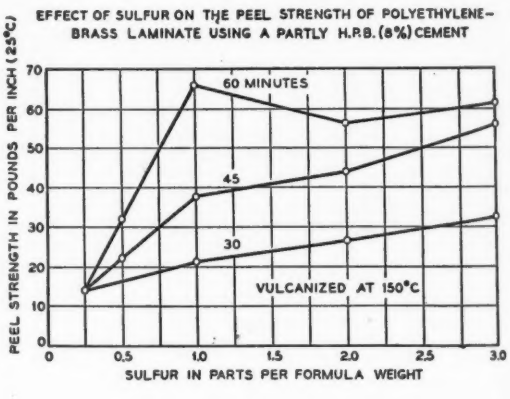
As shown in Fig. 9, the peel strength of brass bonded to polyethylene decreases with increase in temperature. The band strength falls off rather sharply at 50° C. and approaches a value of 15 p.i. at 75° C. For printed circuit boards and the like, this is still considered a respectable value in view of the 6–8 p.i. obtained in industry.

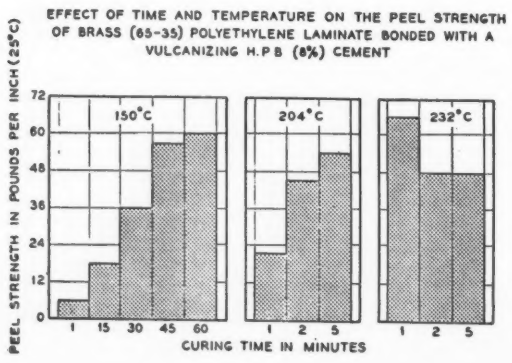
Bonded brass-polyethylene laminates were aged for various periods of time and temperature. Peel strength measurement was made at 25° C. The results, tabulated in Table III, show that after three months' exposure to various temperatures, the peel strength remained relatively stable, with the exception of those exposed to 100° C. where some degradation of the bond strength was noted.

TABLE III. EFFECT OF HEAT AGEING ON THE PEEL STRENGTH OF BRASS VULCANIZED TO H.P.B.—POLYETHYLENE LAMINATE

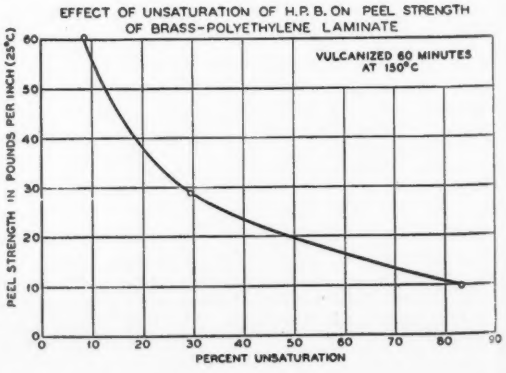
Ageing Time—Days	Peel Strength (p.i.)—25° C.		
	Ageing Temperature ° C.		
	25	70	100
1	57	—	—
30	52	74	31
90	54	67	36

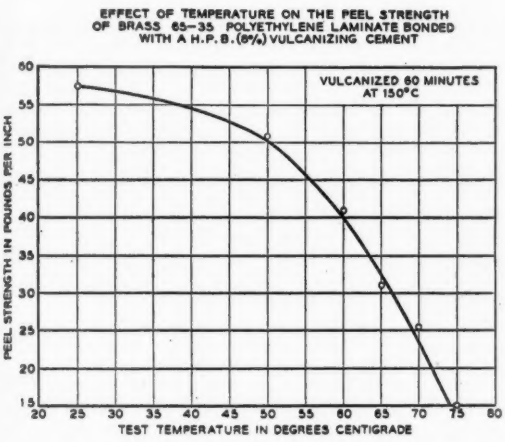
Bonding natural rubber, SBR (75% butadiene—25% styrene), NBR (82% butadiene—18% acrylonitrile), and CR (Neoprene), to polyethylene is accomplished in the same manner as bonding polyethylene to brass. Peel tests are not feasible, because in most cases the tear strength of the rubber is considerably less than the adhesive bond between the rubber and polybutadiene. In view of this shortcoming, a button adhesion


EFFECT OF SULFUR ON THE PEEL STRENGTH OF POLYETHYLENE-BRASS LAMINATE USING A PARTLY H.R.B. (8%) CEMENT
PEEL STRENGTH IN POUNDS PER INCH (25°C)
60 MINUTES
45
30
VULCANIZED AT 150°C
SULFUR IN PARTS PER FORMULA WEIGHT


EFFECT OF TIME AND TEMPERATURE ON THE PEEL STRENGTH OF BRASS (65-35) POLYETHYLENE LAMINATE BONDED WITH A VULCANIZING H.P.B (8%) CEMENT
PEEL STRENGTH IN POUNDS PER INCH (25°C)
150°C
204°C
232°C
CURING TIME IN MINUTES

(Top Right) Fig. 6.
(Left) Fig. 7.
(Right) Fig. 8.


EFFECT OF UNSATURATION OF H.P.B. ON PEEL STRENGTH OF BRASS-POLYETHYLENE LAMINATE
PEEL STRENGTH IN POUNDS PER INCH (25°C)
VULCANIZED 60 MINUTES AT 150°C
PERCENT UNSATURATION



Left, Fig. 9 showing peel strength plotted against temperature,

test A.S.T.M. D-429 was used as a means of evaluating the bond strength in tension. This method has its limitations too, inasmuch as erroneous results are obtained because of occasional tearing of the rubber.

Fig. 10 is a model of a test specimen. It has the following laminated structure: 70/30 brass, 0.04 in. disc of a vulcanizable polybutadiene, 0.20 in. disc of polyethylene, 0.04 in. disc of a vulcanizable polybutadiene, 0.20 in. disc of a vulcanizable rubber, 0.04 in. disc of a vulcanizable polybutadiene and 70/30 brass. The entire sandwich is vulcanized for one hour at 287° F. in a mould recommended by ASTM D-429. The sandwich is aged three days before it is tested.

A laminated structure of this type makes it possible to determine the weakest link in the assembly. Usually the bond breaks between the rubber and the bonding agent. More often it is a material failure of the rubber and occasionally a clean break is obtained at the joining interface. Failure between polybutadiene (8% unsaturation) and polyethylene has never occurred, indicating the superiority of this bond over rubber-polybutadiene (8% unsaturation). As shown in Table IV, some of the values are approaching 1,000 p.s.i. It is believed that rubbers with a greater modulus and improved tear resistance would produce values in excess of 1,000 p.s.i.

The formulations selected for this investigation are typical and should not be considered selective. Other compounds should perform equally well. However, it is possible that other fillers, plasticizers and accelerators, may have a pronounced effect on the degree of adhesion. Also the rate of vulcanization may have a profound influence on the bond strength. Vulcanizing agents other than sulphur produce satisfactory adhesion. Dicumyl peroxide has been found unusually good in this respect.

The bonding between a vulcanizable rubber and a vulcanizable, partially hydrogenated polybutadiene is apparently due to the formation of chemical crosslinks at the interface. It is possible to omit the vulcanizing and compounding ingredients from the partially hydrogenated polybutadiene and depend upon sulphur or peroxide migration from the vulcanizable rubber during the curing cycle. The resultant bond is strong but inferior to the bond obtained with a compounded polybutadiene.

This bonding process permits hard rubber, made from natural rubber, to bond to polyethylene. Hard rubbers from other synthetic polymers should perform equally well.

Conclusions

With this new bonding process, polyethylene can be bonded to brass, brass-plated metals and rubbers (natural-NR, styrene-butadiene-SBR, nitrile-butadiene-NBR and chloroprene-CR). This method produces bonds with tensile strengths up to 1,000 lb. per sq. in., and peel strengths ranging from 60–100 lb. per in.

The process makes use of the product known as Hydropol (partly hydrogenated polybutadiene) manufactured experimentally by the Phillips Petroleum Company of Bartlesville, Oklahoma. Various ingredients are added to the partly hydrogenated polybutadiene to make it capable of vulcanization. Apparently the partly hydrogenated polybutadiene heat seals to the polyethylene because of its similar chemical structure. The bond to a vulcanizable rubber is probably due to the formation of sulphur cross-links at the interface that occur during vulcanization. Bonding to brass is accomplished through the accepted theory of selective sulphiding of the metal. A brass with a copper content of 65–75% gives the best bonds. Polybutadiene with 3–30% unsaturation appears to give the best adhesion.

A layer of bonding agent 2 to 3 mils. thick is desirable for proper adhesion. The bonding agent may be dissolved in a solution and sprayed, brushed or dipped to provide the desired layer, or a thin sheet can be fabricated and inserted between the materials to be bonded.

Bonding is accomplished at temperatures ranging from 150° to 232° C., and at pressures of 100 p.s.i. or less, although higher temperatures and pressures may be used.

Some of its major applications may be the bonding of polyethylene insulation to wire and cable, printed circuit boards, submarine cable repeaters, coatings for tank linings and plating racks, missiles and bonding polyethylene uppers to rubber soles for the shoe industry.

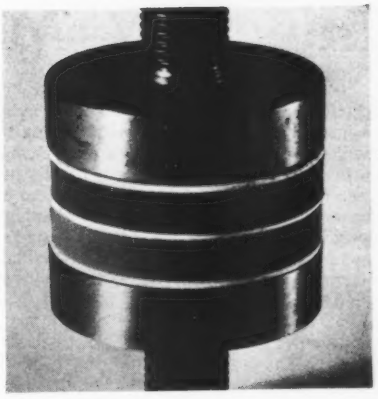


Fig. 10. Model of test specimen of laminate of brass, polybutadiene and polyethylene.

TABLE IV. RUBBER FORMULATIONS

Ingredients	Parts by Weight						
	1	2	3	4	5	6	7
Natural Rubber (NR)	100.0	100.0	100.0	100.0	—	—	—
Styrene-Butadiene (SBR)	—	—	—	—	100.0	—	—
Nitrile-Butadiene (NBR)	—	—	—	—	—	100.0	—
Chloroprene (CR)	—	—	—	—	—	—	100.0
Magnesium Oxide	—	—	—	—	—	—	4.0
Zinc Oxide	200.0	50.0	5.0	—	5.0	5.0	5.0
Stearic Acid	0.5	0.5	2.0	—	—	1.5	—
Petrolatum	5.0	5.0	—	—	—	—	—
Light Process Oil	—	—	—	—	15.0	—	—
Sulphur	3.0	3.0	3.0	32.0	2.0	1.5	2.0
2-Mercaptobenzothiazole	0.5	0.5	1.0	—	—	1.5	—
Benzothiazyldisulphide	—	—	—	—	0.4	—	—
Tetramethylthiuram Monsulphide	—	—	—	—	0.4	—	—
Aldehyde-Amine No. 808	—	—	—	1.0	—	—	—
Trimethyldihydroquinoline	1.0	1.0	—	—	—	—	—
S.R.F. Black	—	—	50.0	—	50.0	—	—
F.T. Black	—	—	—	—	—	50.0	50.0
Hard Clay	—	—	—	85.0	—	—	—
Hard Rubber Dust	—	—	—	20.0	—	—	—
Adhesion (p.s.i.)	950	700	1000	—	710	—	810

References

1. Blow, C. M., *India Rubber Journal*, **111**, No. 15, p. 522 (1946).
2. Buchan, S., Rubber to Metal Bonding, Crosby Lockwood & Son, Ltd., London, England, p. 161 (1948).
3. Gurney, W. A., *Trans. Inst. Rubber Ind.*, **18**, 207 (1943).
4. Hood, G. H., *India Rubber World*, **44**, 374 (1911).
5. Jones, R. V., Moberly, C. W., and Reynolds, W. B., *Ind. Eng. Chem.*, **45**, 1117–1122 (1953).
6. McCortney, W. J., *Vanderbilt News*, **3**, No. 6, 8–9 (1933).
7. Morron, I. D., *India Rubber World*, **98**, No. 4, 35–38 (1938).
8. Peters, H., U.S. Patent 2,635,975 (April 21, 1953).
9. Sanderson, C., British Patent, 3288 (1862).
10. Satake, J., *Rubber Ind. Japan*, **8**, 461 (1935).
11. Standard Telephones & Cables Ltd., British Patent, 583, 694 (Dec. 24, 1946).

Injection Mould for Sink Waste Trap

THE Plumbing Industry is taking a lively interest in plastics, and whilst having to overcome the usual conservatism when changing over to new materials is already using many miles of plastic tubing and fittings. One of the more recent newcomers to the plumbing world is the plastic sink waste trap. These are now made as complete moulded assemblies incorporating the main body, trap, elbow, union nut, and outlet pipe.

The accompanying photograph shows a mould which was designed and made by Fox & Offord Ltd., for McAlpine & Co., Ltd., of Glasgow, which produces in one shot the body, trap and two union nuts in Alkathene. The moulded trap has an internal thread which engages with the external thread in the body. The nuts are used for fixing the assembly to the sink outlet, or the outlet pipe to the assembly.

The two threads on the body, being external, are moulded in each half of the mould, and the internal threads on the other two components are moulded by cores which are removed from the mould and extracted by hand from the mouldings.

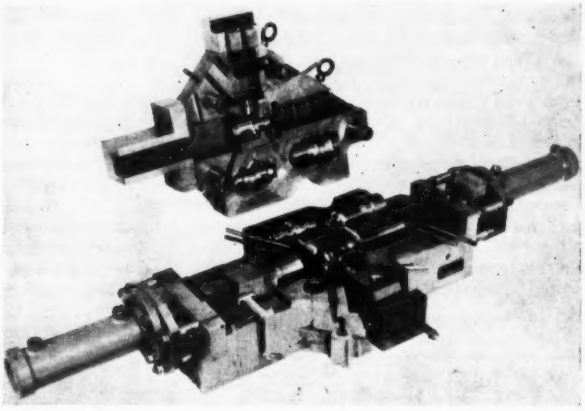
The core for the 7 in. long bore inside the body and the core for the barrel of the body are diametrically opposed and it was decided to extract these cores hydraulically. $2\frac{3}{4}$ in. dia. double acting Keelavite cylinders are fitted for this purpose as part of the mould build up. As the moulding pressure on these cores could be as much as 20 tons an interlock is incorporated to hold them securely in position when the mould is closed. The core for the body side outlet hole is attached to a slide actuated by an angular pin, thus automatically extracting the core as the mould opens.

The moulding has walls nearly $\frac{3}{16}$ in. thick, calling for extensive water cooling of the moulds if a reasonable cycle time is to be accomplished. The mould cores are vulnerable to high thermal conditions as the gating system is such that incoming hot plastic strikes the cores first, and in the case of the body central core, as it is surrounded not only by a thick plastic wall but the barrel core as well, heat dispersion is particularly difficult. Another important point is that the three components are very different from each other thus creating different local thermal conditions. For these reasons a complex water cooling system is incorporated with independent circuits for the cores and separate circuits for different parts of the mould.

Final ejection of the moulding is done with pins on an ejector plate, operating inside an ejector box, and actuated during the last inch of the mould opening stroke by the press ejectors. With the mould fully opened the ejectors would, of course, be in the forward position and as the cores for the trap and nuts have to be loaded with the mould in this position, special provision in the ejector system is made to do this, and yet provide adequate protection for the cores to remain safely in position as the mould closes.

Due to the necessity to lock the cores in position when the mould is closed it is not possible to extract them until the mould parts. Also as the moulding cannot be ejected until the cores are extracted the core movement is made after the mould has opened, and before reaching the last inch of the opening stroke. The mould operates on an 8 oz. Peco and the machine hydraulics are used for the core cylinders. In co-operation with the Projectile and Engineering Co., a circuit was devised incorporating the necessary microswitches, relays, solenoid operated hydraulics valves, etc., to give a completely interlocked automatic cycle operation. All the operator has to do is to press a button to start the machine in motion, and the mould automatically closes, material is injected, the mould opens, and the mouldings are ejected, the hydraulic core operation automatically synchronizing with the other movements. By duplicating the loose trap and nut cores complete sets of mouldings are thus produced at a high rate of production.

(Left) The completed waste trap.



(Right) The complex mould used for the production of the waste trap.

New Thermoplastic Sheet

AN announcement was made last month by Wallington Weston & Co., Ltd., of Frome, Somerset, of the availability to industry of a new thermoplastic sheet material which has some interesting properties particularly in its impact resistance figures. Known as FromoPLAS N the sheet is reported as being a copolymer with high tensile strength and impact resistance 10 to 15 times that of most rigid thermoplastics. It is non-inflammable and is produced in a range of pastel and other shades in sheets up to 8 ft. × 3 ft. in size and from 0.020 in. to 1 in. in thickness. It is also available in some decorative finishes. It has excellent ageing and dimensional stability, and is resistant to grease, petrol and hydrocarbon oils and most acids, alkalis and solvents. In addition it is non-inflammable and has good dielectric properties. It can be easily cut, machined, drilled or punched and responds most satisfactorily to forming by the usual vacuum and other normal processes.

Substantial pilot production has been absorbed to date almost entirely by the aircraft industry, in the form of large panels and of moulded shapes, as for window fairings, ducting, etc., for which purpose it is being used in most of the leading types of civilian aircraft and has been specified by the M.O.S. for their latest transport planes. For applications where contact with food is involved a special grade, FromoPLAS N.F., is supplied.

Summary of Properties

Specific Gravity	1.37
Tensile Strength p.s.i.	6,500
Impact Strength. Izod.	6.5–7.5 ft. lbs. $\frac{1}{4}$ in. sq. notched bar
Ageing Stability	Excellent
Softening point	75°–78° C.
Humidity and water absorption ...	Negligible
Effects of Acids	Resistant to most acids
Effects of Alkalis	Generally no effect
Solubility in organic solvents ...	Soluble in Ketones and Esters
Dielectric properties	Excellent
Flame Test	Non-inflammable

Where applicable the above readings were taken at 20° C.

Plastics in the Laboratory—Part 4

By G. HAIM

This is the last instalment of this series. The author here describes the use of plastics in squeegees, stoppers, test-tubes, test-tube racks, thistle funnels, trays and troughs, test-tube washers, valves, wash bottles, waste bins, weighing bottles, and miscellaneous applications

Spot Test Tiles

Modern laboratories nowadays carry out spot tests for quantitative analysis. The conventional porcelain spot test tile is very often warped and breaks on impact. P.v.c. spot test tiles follow closely the design of porcelain tiles, but they do not break. In time they will probably replace ceramic spot test tiles entirely.

Squeegees

Where rubber squeegees cannot be used, e.g. for concentrated nitric acid and the like, squeegees made from plasticized p.v.c. or polythene can be employed.

Stoppers

Glass vessels such as measuring cylinders, measuring flasks, volumetric flasks and reagent bottles are usually fitted with ground-in glass stoppers. These have a tendency to get "frozen in," and their removal by warming or by tapping with a tool usually results in breakage at the neck of the bottle. Glass stoppers are usually not of standard design and cannot be transferred from one bottle to another, so that the whole vessel becomes useless and has to be replaced for loss of a stopper.

Moulded polythene stoppers prove the answer, as they have enough flexibility to allow for slight variations, i.e. they will allow for slight dimensional differences. They are supplied in a number of standard sizes. One particular make has a hollow body, and the air cushion thus provided makes for perfect closure.

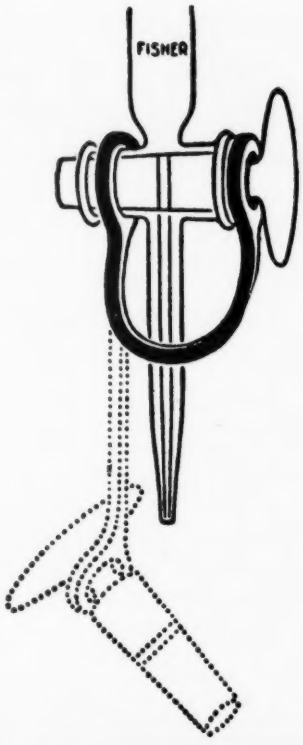


Fig. 37. Plastics stopper tie.

Stopper Ties

Graduated glassware and burettes are very often broken when an unsuitable stopper or stopcock is inserted. Plastic stopper ties help to reduce these accidents, as the appropriate parts can be held together to avoid their being mislaid. Fig. 37 shows a stopper tie in position.

Test-tubes

Polythene and nylon test-tubes are used in many instances. They are, of course, not as universally applicable as glass test-tubes, neither can they be used over a Bunsen burner, but they have the advantage of being unbreakable.

Polythene, nylon and cellulose acetate centrifuge tubes are other useful items in growing demand. Being moulded, they scarcely vary in weight and balance perfectly in the cradle of the centrifuge.

Test-tube Racks

Wooden test-tube racks were already in use more than 150 years ago, and their design has changed little since. They are rather ugly and clumsy, and they have the further disadvantage that they collect dust and become impregnated with all kinds of corrosive liquid in course of handling. The first plastic test-tube racks followed the conventional design of wooden racks but were not pleasing in appearance (see Fig. 38). They are made with 12 or 24 cavities but do not as a rule take test-tubes larger than ¾ in. in diameter. Frequently test-tube racks are purchased without specifying the diameter

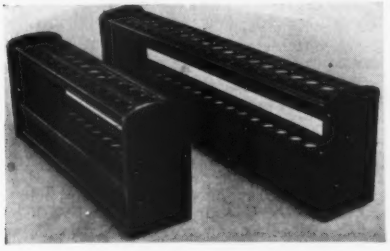


Fig. 38. Early plastics test-tube rack.

of the test-tubes to be employed. If they are larger than ¾ in., they will not fit into a plastic rack unless this has been made to order. It is, therefore, recommended that the size of test-tube be indicated when a test-tube rack is purchased. Racks with 24 and 36 cavities are obtainable, which are particularly useful for Butyrometer tests. The so-called "S" shape test-tube rack (Fig. 39) is more pleasing in appearance and cheaper than those previously

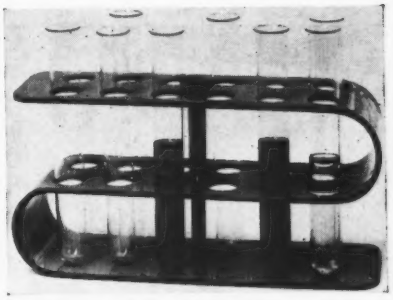


Fig. 39. "S" shape test-tube rack.

mentioned, but it is still not as convenient to use as the acrylic stand illustrated in Fig. 40.

Thistle Funnels

Moulded polythene thistle funnels (Fig. 41) are used in place of glass thistle funnels for levelling the liquid in gas burettes and to facilitate liquid transfers. They are supplied

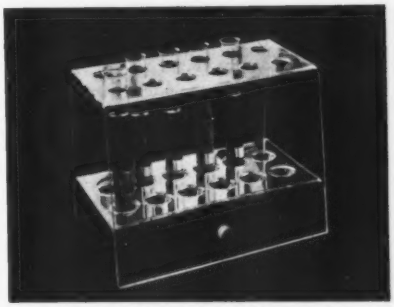


Fig. 40. Acrylic test-tube stand.

with or without stem and are generally suitable for ¼ in. bore rubber or plasticized p.v.c. tubing.

Trays and Troughs

Polythene and p.v.c. trays are made in a great variety of sizes from stock materials such as sheet and bar by welding. Due to the fact that they are fabricated individually and not moulded, there are practically no limits as far as size is concerned, and they can be fitted into equipment to suit a customer's requirements.

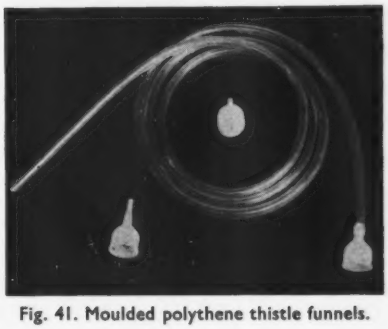


Fig. 41. Moulded polythene thistle funnels.

Test-tube Washers

The handling of large numbers of test-tubes in hospitals and biological laboratories may cause a problem, especially in countries where labour is scarce and expensive. Automatic test-tube washers are in use in the United States and in Canada, and they may, in future, become of interest in other countries, although at the present time they are rather a luxury item.

The plastic test-tube washer shown in Fig. 42 consists of a p.v.c. rectangular trough with an

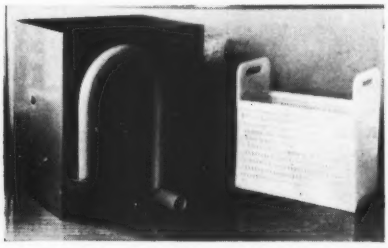


Fig. 42. Plastics test-tube washer.

inverted siphon and a polythene basket suspended on pivots. Water from the mains enters the trough and will rock the basket via a float as the level of the liquid in the trough rises or falls. The trough empties in approximately 2½ minutes and fills in 4 minutes. Provision is made to keep the test-tubes in position, i.e. they cannot float freely to the surface.

Valves

Plastic materials lend themselves particularly well for the construction of valves on account of their inertness to a great many chemical solutions. The polythene diaphragm valve shown in Fig. 43 is a most successful substitute for a glass stopcock in a burette. This type of

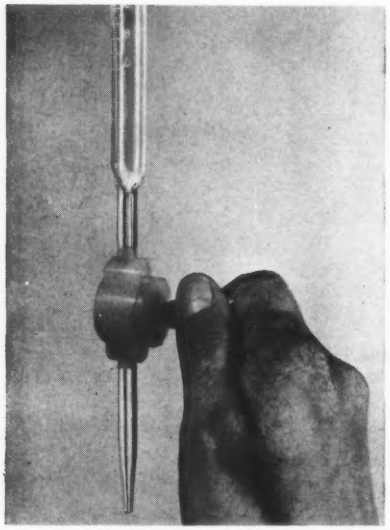


Fig. 43. Polythene diaphragm valve (Courtesy Townson & Mercer Ltd.)

valve is particularly recommended for strong alkaline solutions where glass stopcocks "freeze" and become unusable.

American laboratory furnishers propose a p.t.f.e. (Teflon) valve for the same purpose. This is much more expensive than the polythene valve mentioned above but cannot be operated to the same degree of accuracy as the English model.

Wash Bottles

Polythene wash bottles are nowadays a standard outfit, replacing to a certain extent the glass bottles hitherto used.

Waste Bins and Waste Boxes

Large polythene waste bins moulded in ordinary, high pressure polythene and linear, high molecular weight, low pressure polythene are quite useful for waste and refuse boxes in laboratories, where acidic filter papers and the

Fig. 44. Fabricated polythene waste box fitted underneath laboratory bench.

like are thrown away. Care is necessary where they are used, as cigarette stubs not properly extinguished may cause a fire, and polythene might support it. Fig. 44 shows a fabricated polythene waste box fitted underneath a laboratory bench.

As an alternative to polythene, waste boxes of rectangular shape fabricated from rigid p.v.c. sheet are sometimes used.

Water-purifying Units

Polythene water-purifying units filled with acrylic ion exchange resins are used in many laboratories for the production of distilled water on site. They are, however, generally limited in output.

The simplest outfit of this kind is a polythene bottle with a resin-filled container mounted on the top, through which ordinary tap water passes before being dispensed. Sometimes indicators are employed to warn the operator that the useful life of the resin has expired.

Fig. 45 shows a polythene ion exchanger capable of yielding approximately two gall. per hour. Considering the small size of the equipment, it is not surprising that these ion exchange units are rapidly finding their way into chemical laboratories. The resin container can readily be replaced by a fresh container while the exhausted material is returned to the manufacturers for reactivation.

The equipment consists of a storage tank A with an overflow valve L, a conductivity cell C, a control valve D and ion-exchange resin cartridge B and all flow lines.

Polythene is essential in the construction of this kind of equipment, as storage of purified

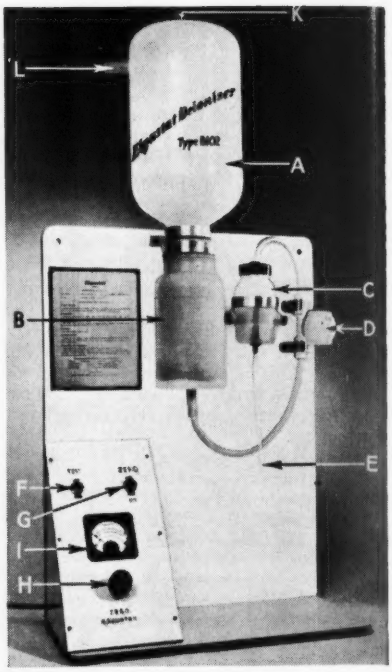


Fig. 45. Polythene ion exchanger (Courtesy Elga Products Ltd.)

water in glass for even short periods results in alkali and silica absorption.

Weighing Bottles

Moulded polythene weighing bottles (Fig. 46) with tight-fitting lids are available in various sizes, whilst polystyrene bottles are at the present time made in only two or three sizes. It should be borne in mind that changes in

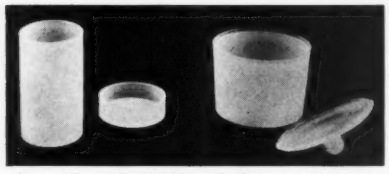


Fig. 46. Moulded polythene weighing bottles.

weight will not be as easily detected with these as with glass weighing bottles, where cracks or chip marks at once indicate that the bottle is damaged.

It is recommended that the weight of plastic weighing bottles be checked much more frequently than is the common practice with glass.

Miscellaneous Applications

An attempt has been made to enumerate and describe the more important applications of plastic materials in a laboratory. The list could be extended considerably by describing minor applications such as plastic (self-adhesive) tape, p.v.c. washers, p.v.c. or isocyanate foam sponges, Terylene or p.v.c. sash-cords for fume cupboards, silicon oils and greases for ground glassware joints, polythene sample bags and the like.

The assistance of Rediweld Ltd., Crawley, Sussex, in providing the majority of the photographs illustrating this paper is gratefully acknowledged. Thanks are also due to Edwards (High Vacuum) Ltd., Crawley, Sussex, for the photograph of the Bakelite jet pump, and to

(*Continued on page 236.*)

Patent Review

The following abstracts have been made from specifications at the Patent Office, with the permission of the controller of H.M. Stationery Office. The country of origin for Convention Applications is shown in parentheses. Complete specifications can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 3s. 6d. each (including postage).

B.P. 790,317. Take-off machines suitable for extruded plastics. H. Powell. To: Erinoid Ltd.

Vertically spaced shafts with pairs of profiled rollers to receive between them the extruded plastic and with gear trains to rotate the shafts at uniform speed in opposite directions. The spacing of the shafts is adjustable.

B.P. 790,365. Device for the manufacture of packing rings from a continuous tape of flexible material. To: Vetri Industrial S.A.R.L. (Italy).

By winding lengthwise about a core a continuous tape of flexible (plastics) material and joining the edges to form a tube. This tube is fed stepwise to be cut into sections while still on the core to form packing rings.

B.P. 790,367. Reinforced thermoplastic materials. Microcell Ltd., D. J. Hodgson, H. Kremer.

Products of improved tensile and impact strength are injection moulded or extruded from a diced glass fibre reinforced plastic material made by coating or impregnating a continuous filament (thread; yarn of glass) with the thermoplastic material.

B.P. 790,378. Sprinkling or dropping inserts for bottles, containers or the like. H. Bruene.

A hollow cylindrical insert with sealing flanges and a closure plate and an integral pipe extending through the closure plate being small enough to prevent pouring.

B.P. 790,391. Method and apparatus for stretching interlayers for a laminated windshield. To: Pittsburgh Plate Glass Co. (U.S.A.).

Refers to thermoplastic interlayers with a cut-off line between a coloured band and an uncoloured portion curved outwardly from the central portion which is rectilinear.

B.P. 790,426. Plastic tap or valve, particularly for glass burettes. Townson & Mercer, Ltd., R. B. Brock.

Broken tubing can be readily detached and replaced.

B.P. 790,444. Headgear with removable rigging unit. L. P. Frieder (U.S.A.).

To provide a headgear (plastic safety helmet) in which the shell may be manufactured as one unit, the rigging as a separate unit.

B.P. 790,447. Footwear soles. To: Sandal S.r.l. (Italy).

A plastic sole with an integral heel. The tread portion is recessed inside a surrounding rim to accommodate a resilient projecting insert so that the rim normally does not touch the ground.

B.P. 790,484. Dyeing plastic sheeting. To Pittsburgh Plate Glass Co. (U.S.A.).

The transmission coefficient of laminated safety glass is regulated by the amount of dye imparted to the plastic sheet. Uniform dyeing requires uniform tension of the sheet during immersion, otherwise streaks develop. The sheet is stretched longitudinally and transversely in a non-corrosive frame, trimmed to shape and dyed under tension while in the frame.

B.P. 790,534. Sun visors and methods of making the same. To: Gebr. Happich G.m.b.H. (Germany).

A cushioned glare shield for motor cars made of, e.g. plastic foils enclosing foamed plastics in a resilient wire frame.

B.P. 790,734. Manufacture of lenses. To: Lentilles Ophthalmiques Spéciales S.à.R.L. (France).

Polymerization or polycondensation of the monomer or monomers of the synthetic resin is effected in a mould, one of whose faces is shaped and polished to the final shape. The other final face of the lens is formed by grinding and polishing.

B.P. 790,801. Facing tiles. To: Expansion S.A. (France).

Rectangular plastic tiles with grooves and tongues in the side faces to fit the tiles together. Holes are provided for nailing or otherwise attaching the tiles.

B.P. 791,061. Processes for the manufacture of ball floats. A. A. Lawrence, R. Hagen. To: Lacrinoid Products Ltd.

A thermoplastic float with a metal insert (for attaching the float to the float arm) pressed into the neck of the float formed in the leading end of the tube out of which the float is made. (Add. to: 713,419.)

B.P. 791,066. Guns for projecting plastic products. Soc. Protectal (France).

The coating with molten plastic products (for protection against corrosion and wear) is effected by low pressure hot air forcing the plastics from an internally heated reservoir to the nozzle.

B.P. 791,092. Application of perfluorochloroolefin polymer coating to base materials. To: M. W. Kellog Co. (U.S.A.).

By interposing an epoxide resin between the coating and the base material, then curing the resin under light pressure.

B.P. 791,097. Method of and apparatus for producing thin-walled thermoplastic material. T. O. Lang. To: Ryburn Engineering Co., Ltd.

A heated foil is pressed by the edge of a mould against a table, then compressed air is blown through an aperture in the table urging the foil into the mould while a spring biased plunger in the mould, the head of which conforms to the bottom of the vessel, recedes to the interior of the mould.

B.P. 791,107. Floats and like buoyant bodies and methods for the production of such articles. H. H. Ellerbrock, K. Ellerbrock.

Consisting of a synthetic foam substance having a stiffening insert which is hollow and adapted for the introduction of gases into the foam substance.

B.P. 791,143. Supports for neckties and like articles. H. Knight.

An open frame with top and bottom rail and a resilient strip dependent from the top rail for holding the ties on the bottom rail.

B.P. 791,144. Foamed phenol-formaldehyde condensates. A. Lambert, G. H. Lang. To: I.C.I. Ltd.

A sulphonhydrazide and an acid catalyst are mixed with a liquid condensate of phenol and formaldehyde.

B.P. 791,162. Holders for wreaths and other articles. L.C. Philips. To: Philips & Cross Ltd.

Consisting of an attachment part and a peg part held together by a press-stud action.

B.P. 791,184. Process for stabilizing polyvinyl chloride and articles of manufacture made from polyvinyl chloride which has thus been stabilized. To: Nederl. Castorolie-fabriek Necof N.V. (Netherlands).

B.P. 791,206. Process and a device for packing liquids and pastes in a thermoplastic material. To: N. V. Technische Handel Maatschappij Automaco (Netherlands).

The liquid or paste is enclosed in a compartment of a tube having one end closed. A pressure member is then moved so as to press away the liquid or paste in backward direction, whereupon closing of the other end is effected by dielectric heating. Thus the pressure of the contents can be adjusted to avoid squirting when opening the container.

B.P. 791,234. Mixing and extruding apparatus for thermoplastic materials. To: Welding Engineers Inc. (U.S.A.).

It has been found that a negative compression ratio in a portion of the worm realizes a marked improvement. This is achieved by progressively increasing the cross-sectional area of the passage over a predetermined length of the worm or also decreasing it in addition to create a positive compression ratio over a further length.

B.P. 791,247. Manufactures of closures for bottles and the like. To: Soc. à. R. L. Rical (France).

The plastic "cork" provided with a flange limiting its penetration into the bottle is characterized by two central tongues lying flat on the flange. They can be raised owing to their resiliency then forming a handle for pulling the cork.

B.P. 791,263. Plastic dispersions. To: M. W. Kellog Co. (U.S.A.).

Refers to high molecular weight polymers of perfluorochlorocarbons (for spread coating, dip coating, flow coating).

B.P. 791,265. Tape dispenser. C. Castelli.

With a knife movable to sever a dispensed length of tape.

B.P. 791,441. Setting of the bristles of brushes. R. W. Hankin. To: Lee & James Ltd.

A paint brush the bristles of which are embedded in an unsaturated polyester resin subsequently polymerized. A ferrule may or may not be used.

B.P. 791,471. Apparatus for the manufacture of tubes from thermoplastic materials. To: Kalle & Co. A.G. (Germany).

An extrusion head in which the core supports can each be locally heated to prevent temporary cooling of the plastic when flowing along the supports, which may lead to streaks of reduced stability in the extruded thin walled tube.

B.P. 791,484. Funnels for pouring liquids. H. B. Brabham. To: General Electric Co., Ltd.

Of polygonal cross section formed from thermoplastic (polythene of 0.025 in. thickness) sheets welded together.

B.P. 791,611. Moulded polyethylene containers and methods of forming same. J. S. Heisler, A. Heisler (U.S.A.).

A powder moulding technique for making drum or otherwise shaped shipping containers to be used instead of (glass or polyethylene) carboys in special enclosures saving space and freight. Polyethylene particles are brought on to a heated mould to produce a layer of at least partly coalesced polyethylene particles. The excess powder is then removed and the mould reheated to fuse the particles together.

B.P. 791,612. Moulded polyethylene containers. J. S. Heisler, A. Heisler (U.S.A.).

A powder moulded container with side walls, top and bottom integrally joined conforming to the walls of conventional (cylindrical or cubical) shipping containers, which serve as overpack.

B.P. 791,618. Coating of nylon fabrics. To: United States Rubber Co. (U.S.A.).

With a polyurethane elastomer coating cured *in situ* for shoe uppers.

B.P. 791,663. Fibrous glass-reinforced polymeric styrene moulding compositions. To: Koppers Co., Inc. (U.S.A.).

Moulding compounds obtained by drawing glass rovings through a bath contain more than 35% fibrous glass and are difficult to mould and damage moulds and dies by the abrading action of the glass. Strong, glossy, moulded products with less than 35% fibrous glass are obtainable when preparing the composition by coating fibrous glass rovings with a polymeric styrene aqueous emulsion or suspension or mixture where the proportion of fibrous glass to polymeric styrene is at most 35% to at least 65%.

B.P. 791,881. Handles for hollow ware and the like. S. F. Pearson. To: George Brown (Aston) Ltd.

Refers to the interlocking of a moulded hand grip and the stem attached to the hollow ware (e.g. kettle) by means of a separate strip of (plastic or other) material.

B.P. 791,907. Laminated materials suitable for covering floors. To: Svenska Cellulose A.B. (Sweden).

Floor coverings with a certain amount of springiness on concrete or stone bases (e.g. for athletics) are made from two layers of material glued together, the upper layer consisting of a hard vinyl resin and/or a hard fibre board (" Masonite ") and the lower layer consisting of a soft synthetic plastic foam.

B.P. 791,976. Method of forming glass strands into bodies of predetermined shape. C. E. Bacon, R. V. Slotler, R. W. Meyer. To: Owens-Corning Fiberglas Corp.

Glass fibres are cut to short lengths and conveyed upon a matrix while binding material (resin, adhesive) is applied to them which is then cured. This " preform " serves as reinforcement or core structure for a moulded resin or plastic article. (Add to: 723,724.)

B.P. 791,988. Manufacture of tubing of flexible material. A. W. Duncan. To: Mining Engineering Co., Ltd.

Tubing from a flat strip of, e.g. polyvinyl chloride with overlapping longitudinal edges is made by placing the flatted tube with a strip of inactive material inside the tube between the electrodes of a high frequency welder. Any length of tube may thus be made by seam welding.

B.P. 792,016. Flame-proofed foamed materials. W. Abbotson, R. Hurd. To: I.C.I. Ltd.

Foamed materials made by interaction of polyesters and polyisocyanates may be rendered flame-resistant by incorporation of inorganic phosphates.

B.P. 792,087. Containers for medicines, first-aid kit and other articles. S. D. Rand.

Made from polyvinyl chloride or a flexible copolymer of vinyl chloride and vinyl acetate and coated with a glossy transparent layer for easy cleaning. With a number of pockets and a list of contents behind a transparent sheet.

B.P. 792,105. Constructions having spring-like cushioning characteristics. To: Beauty Products Inc. (U.S.A.).

An arrangement of slits in a somewhat rigid body forming segments binding and abutting on one another when a load is applied and the body distorted. The square shaped body may be made, e.g. of high impact polystyrene or of " Royalite " (plastic copolymer and synthetic rubber).

B.P. 792,187. Curable glycidyl polyether-polyamine compositions. To: Union Carbide Corp. (U.S.A.).

B.P. 792,208. Smokers' ashtray. L. E. S. Guttmann.

With a detachable cup portion perforated at the sides over a cavity in the base adapted to contain an air freshener block.

B.P. 792,222. Pipe structure. C. de Ganahl (U.S.A.).

The pipe is made of at least three layers of glass fibre reinforcing elements embedded in a cylinder of plastic (polyester resin). Two layers are wound helically and the outermost layer extends logitudinally.

B.P. 792,252. Extruding-machine incorporating a filter. H. Corbett. To: Reed-Prentice Corp.

A slidably mounted screen arranged for ejection and inspection or a screen on a rotatable member so that the operator can bring into play a clean area when another area becomes clogged.

B.P. 792,290. Sealing of bags and like containers made of thermoplastic materials and bags and like containers of such materials provided with sealing closing means. Blackburn & General Aircraft Ltd., B. J. C. Grand.

The container is made of relatively thick thermoplastic material (polythene). The portions adjacent its mouth are fused by heat from a wire between these portions while subjected to pressure and the wire remains between the sheets as a rip wire and/or for resealing after opening.

B.P. 792,301. Pouring and drop-dispensing arrangements. I. Goth.

Pouring and drop-dispensing inserts of polythene, p.v.c., or other resilient materials for containers of glass, porcelain, metals, plastics, etc., provided with means for producing capillary suction.

B.P. 792,302. Pouring arrangements. I. Goth.

For spill-free and dripless pouring of liquids of all surface tensions by annularly arranged pouring means.

B.P. 792,308. Method of heat stabilizing halogenated vinylic resins. To: Soc. An. Manufactures des Glaces et Produits Chimiques de Saint-Gobain, Chauny and Cirey (France).

A sulphide of dialkyl-tin or trialkyl tin as a heat stabilizer.

B.P. 792,334. Masonry block having integral moulded facing layer and method of providing the same. J. A. Sergovic. To: Burns & Russel Co.

Use of a resinous composition (polyester type of resin with a monomeric polymerizable solvent) to produce a decorative serviceable surface.

B.P. 792,349. Sheet material with pressure sensitive adhesive. J. Dow, V. R. Cunningham. To: T. J. Smith & Nephew Ltd.

Refers to a tie-coat containing rubber and organic polyisocyanate.

B.P. 792,352. Process for the production of shaped polyamide articles. To: Dynamit-A.G. vormals Nobel & Co. (Germany).

The upright mould is maintained in an inert gas (nitrogen) at a temperature such that the polymer is formed as a liquid melt, then pressure and temperature are altered for cooling and solidifying the melt from the bottom upwardly.

B.P. 792,368. Flameproofing compositions. J. E. Dereich, A. Riihimaki. To: Diamond Alkali Co. (U.S.A.).

A chlorinated organic material with at least 50% of chlorine and at least 20% of an aryl substituted phosphate. For flameproofing resinous polymeric organic materials as used in kitchens, bathrooms, for electrical appliances without impairing transparency, translucency, colour.

B.P. 792,371. Bottles and closures therefor. E. N. Mason & Sons, Ltd., F. A. Soward.

Ink bottles with a dropper feed device in the stopper.

B.P. 792,375. Extrusion of materials. S. C. W. Wilkinson. To: Crane Packing Ltd.

A restraining gear for maintaining longitudinal pressure. Radial pressure is applied to a multi-section collet by fluid cylinder units when extruding, e.g. polytetrafluorethylene.

B.P. 792,434. Flexible tubing. To: Hoover Ltd. (U.S.A.).

With helical corrugations and a reinforcing coil characterized by gradually varying the depth of corrugation from a maximum at one end of the hose to a minimum at the other end.

B.P. 792,440. Sealing gaskets for cabinet doors. To: General Electric Co. (U.S.A.).

Glass fibre filaments bonded together by a thermosetting resin (for domestic refrigerators).

B.P. 792,448. Combined tooth brush and dentifrice dispenser. G. S. Edwards.

B.P. 792,485. Process for the production of hardenable mixtures of polymerizable ethylenic derivatives and unsaturated polyesters. To: Farbenfabriken Bayer A.G. (Germany).

B.P. 792,547. Production of thermoplastic sheet material. To: Celanese Corp. of America (U.S.A.).

The thermoplastic material is extruded in sheet form and while still in plastic condition drawn over one or more stationary cooled surfaces.

B.P. 792,574. Phenolic resins and their use in moulding processes. E. Smith. To: Monsanto Chemicals Ltd.

Particularly for use in shell-moulding.

Plastics in the Laboratory

(*continued from page 234*)

Elga Products Ltd., London, S.W.19, for the illustration of their Elgastat water purifier.

References

1. Burstall, F. H., Swain, P., Williams, A. F., and Wood, G. A., Inorganic Chromatography on Cellulose, Part XI, and Study on the Separation of Tantalum from Niobium and its Application to Quantitative Analysis. *Journal of the Chemical Society*, 1952, April, pp. 1497–1504.
2. Williams, A. F., Inorganic Chromatography on Cellulose, Part XII: The Quantitative Determination of Tantalum and Niobium in Complex Minerals, Ores and Synthetic Materials. *Journal of the Chemical Society*, 1952, August, pp. 3155–3163.
3. Mercer, R. A., and Williams, A. F., Inorganic Chromatography on Cellulose, Part XIII: Determination of Tantalum and Niobium in Low-grade Phosphatic and Siliceous Ores. *Journal of the Chemical Society*, 1952, September, pp. 3399–3403.
4. Coppola, P. P., and Hughes, R. C., Polyethylene Still for Preparation of Pure Hydrofluoric Acid. *Analytical Chemistry*, **24**, (1952), No. 4, p. 768.

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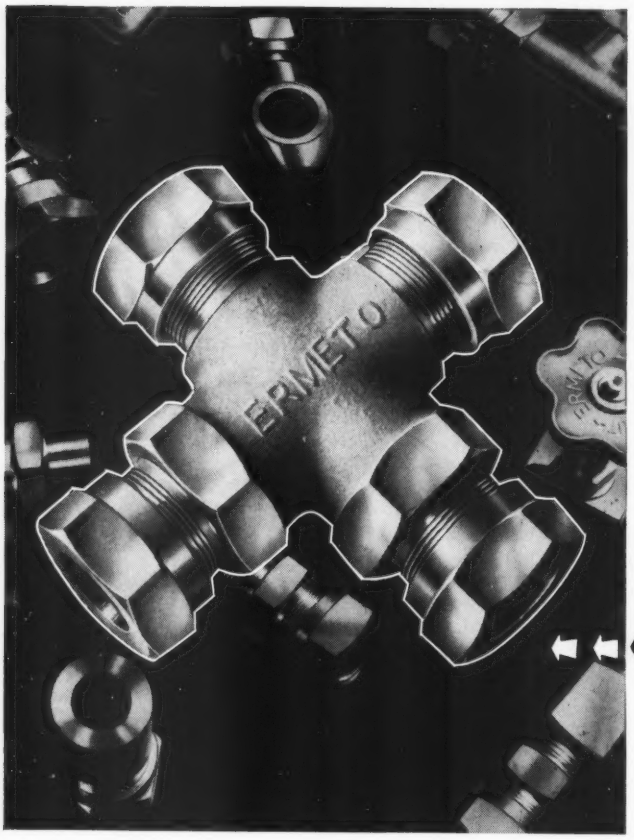

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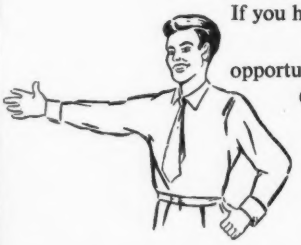

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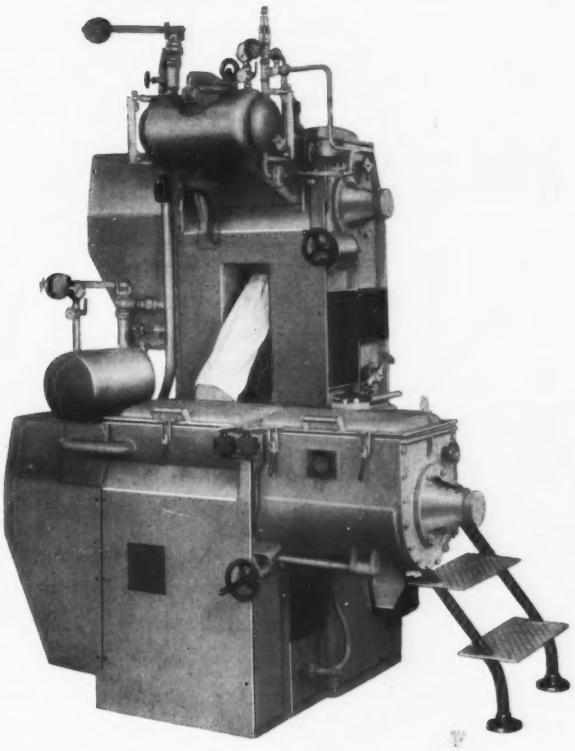

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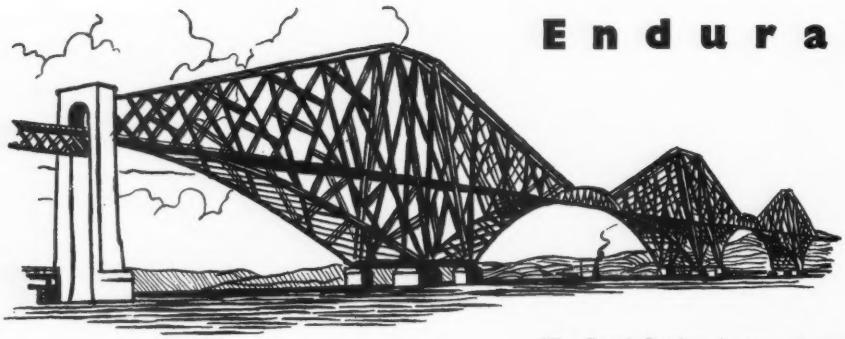

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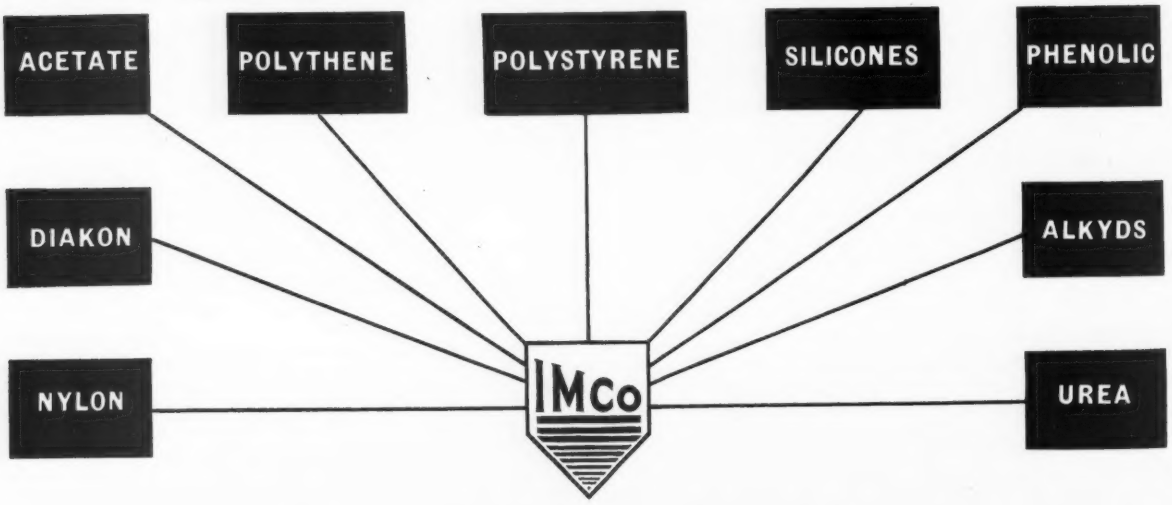

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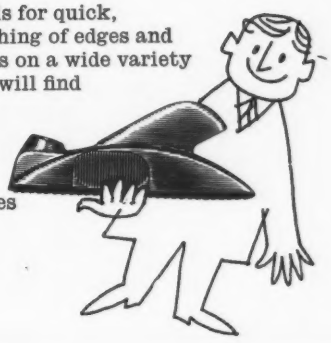

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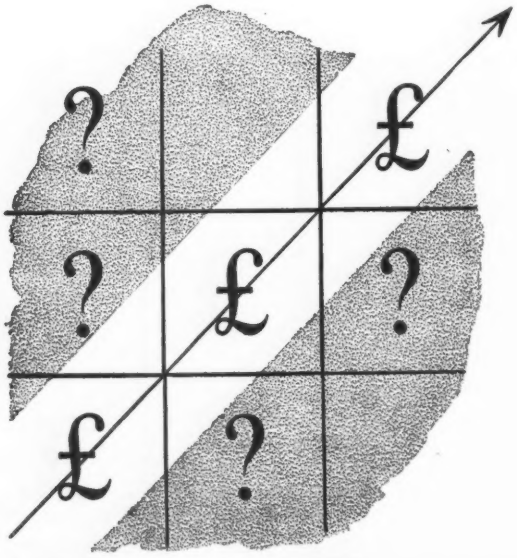

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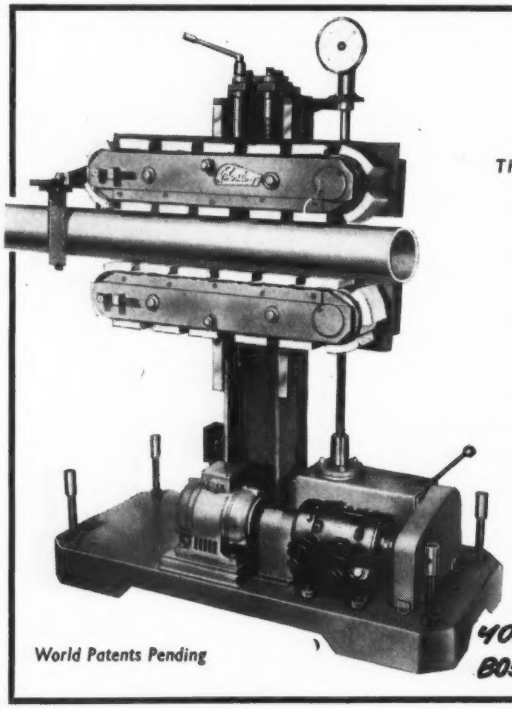

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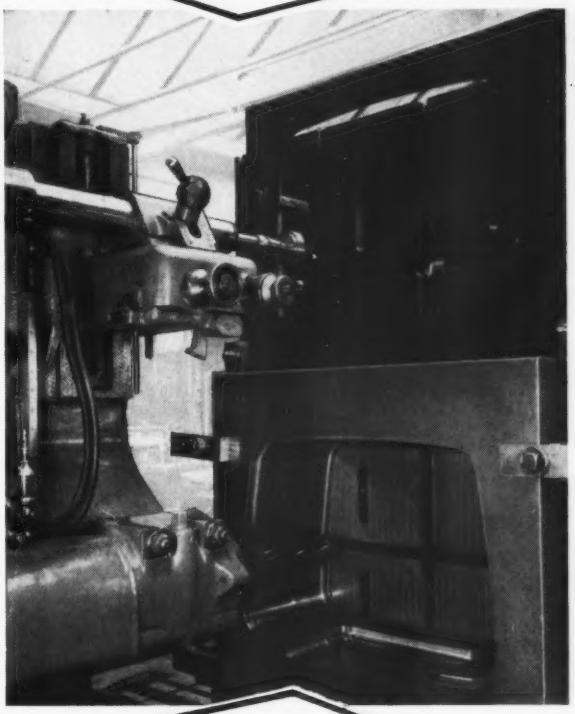

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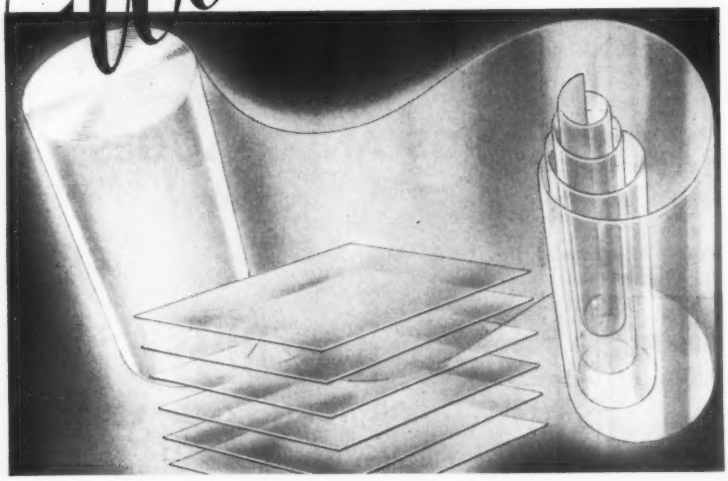

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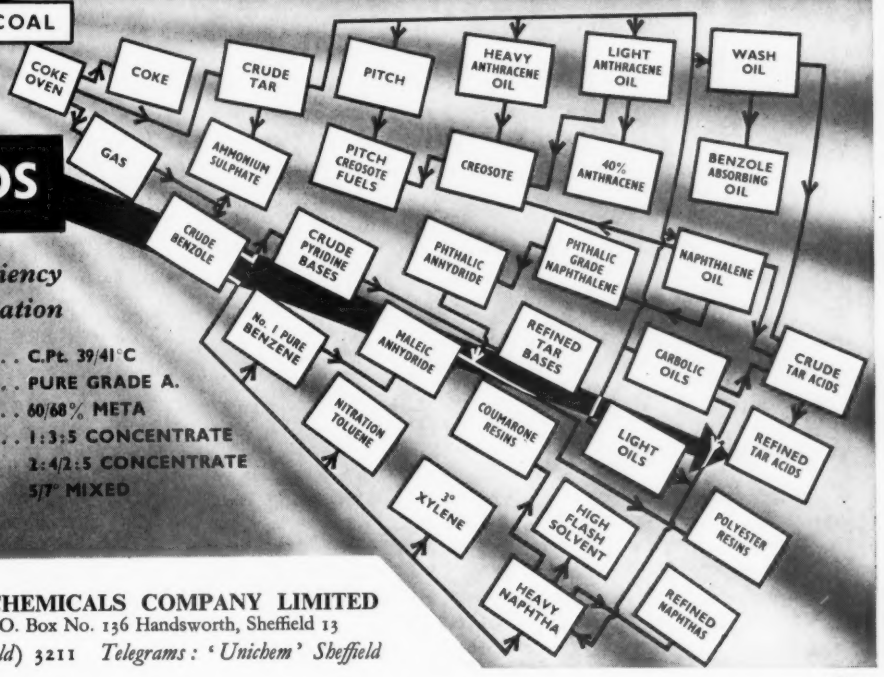

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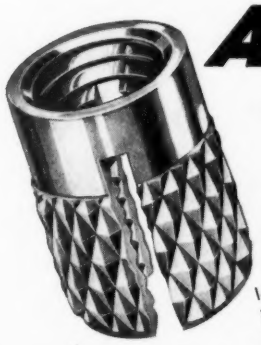

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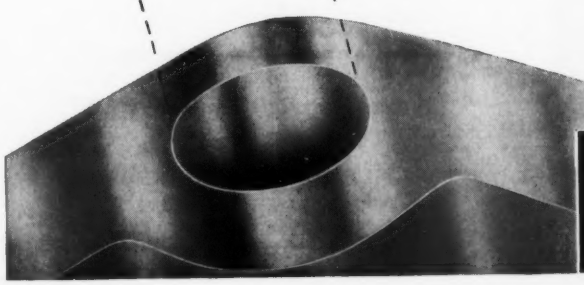

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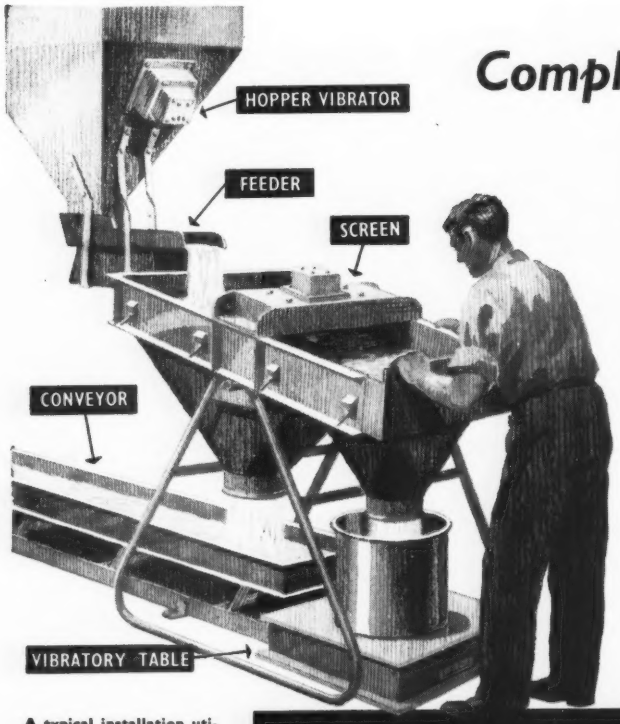

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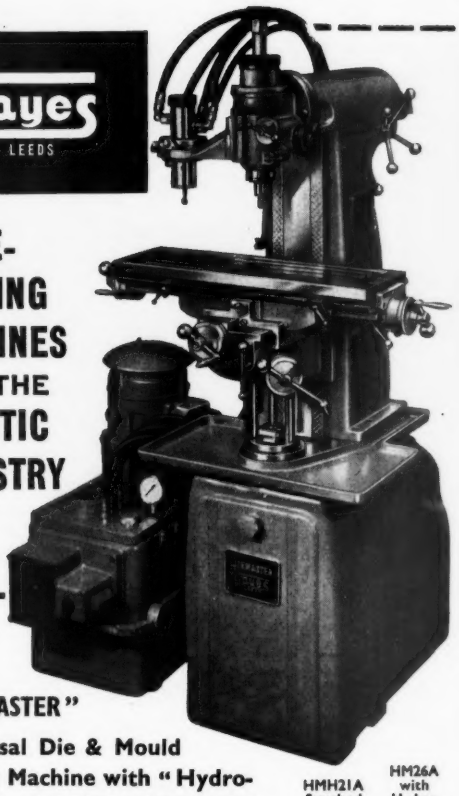

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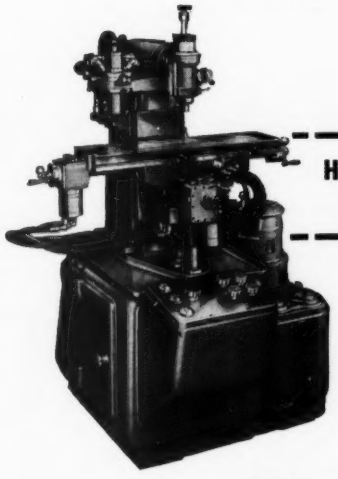

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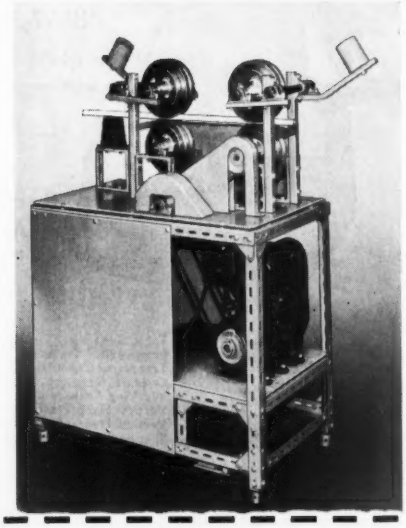

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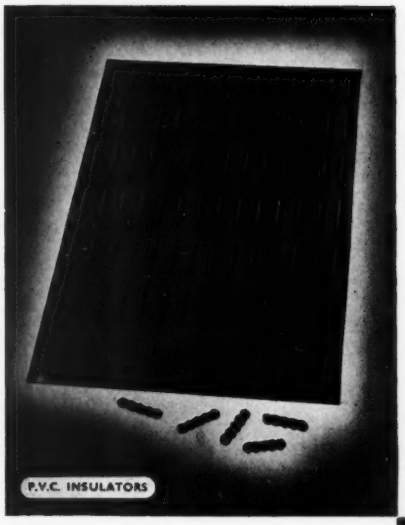

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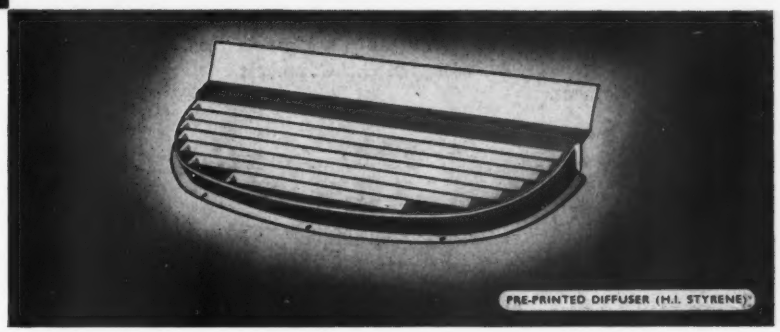

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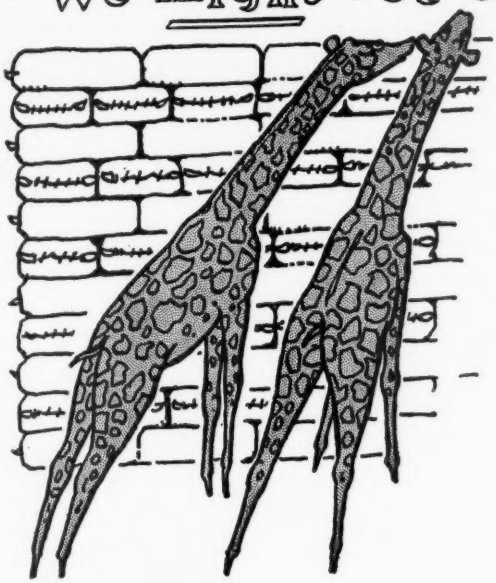

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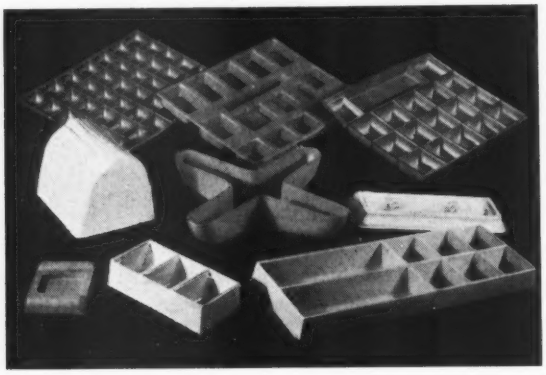

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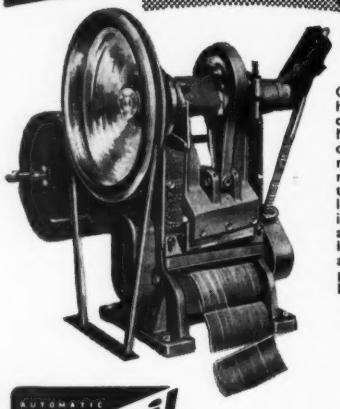

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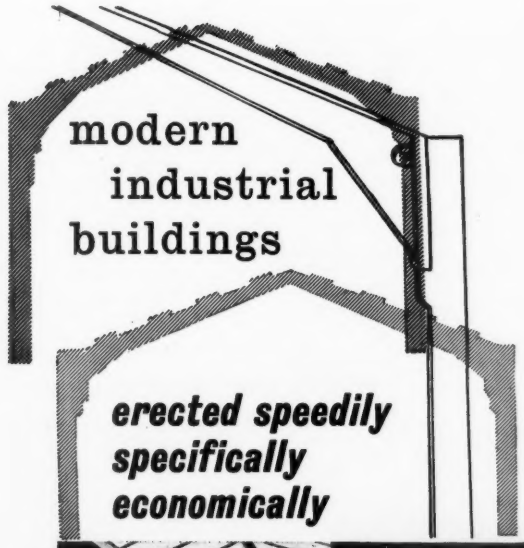

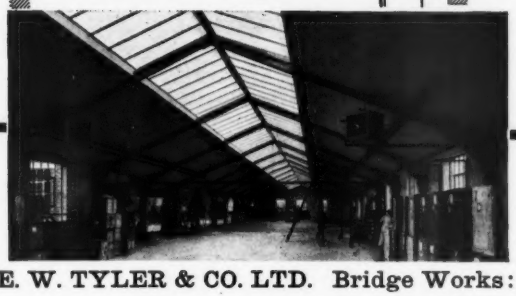

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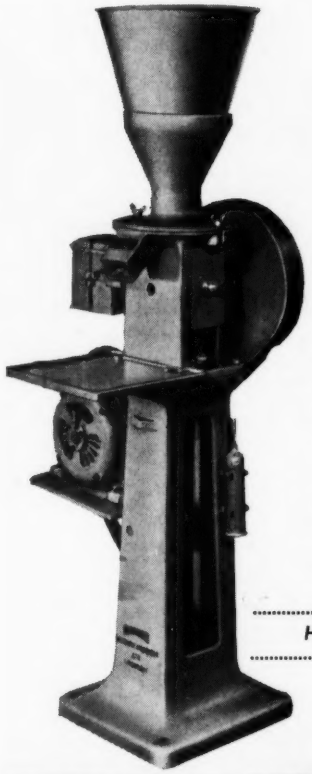

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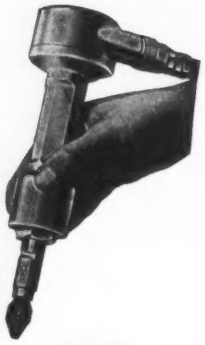

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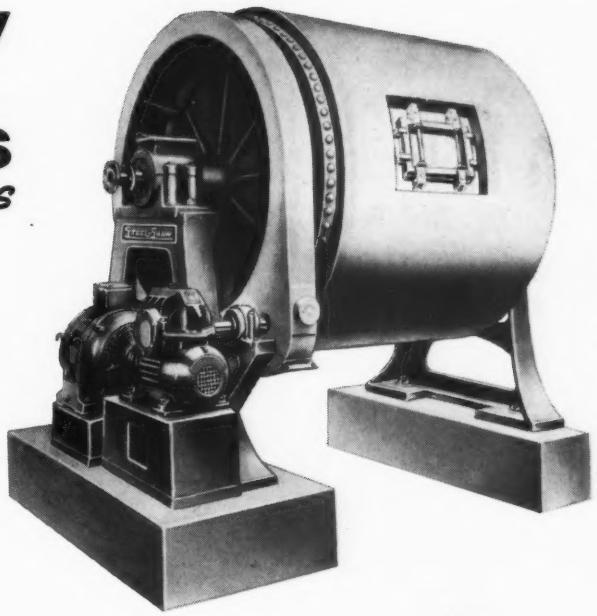

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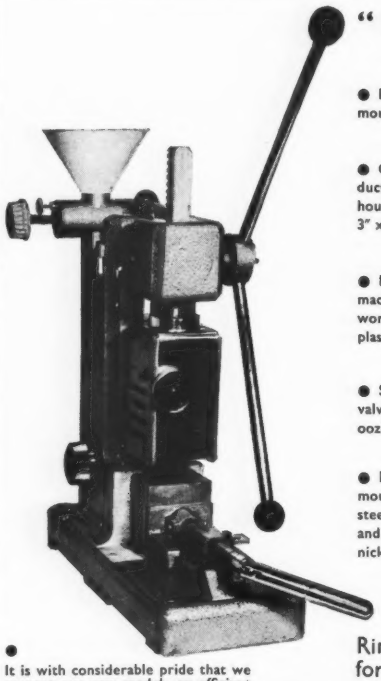

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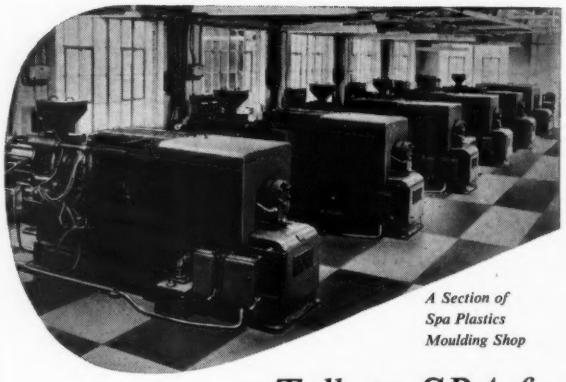

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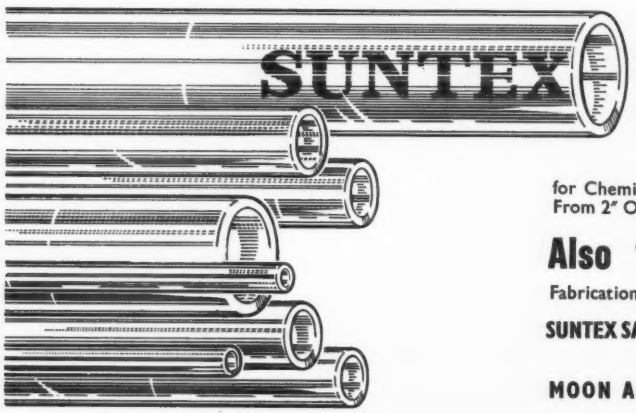

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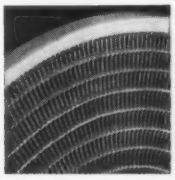

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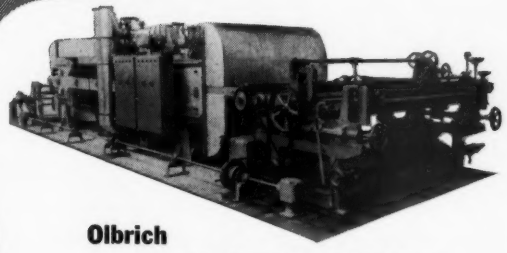

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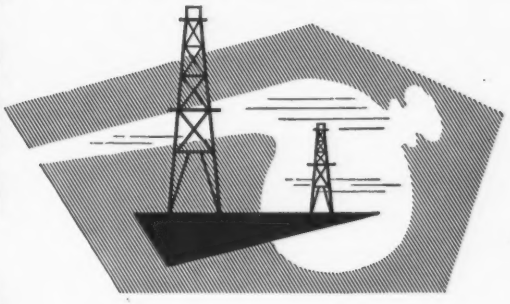

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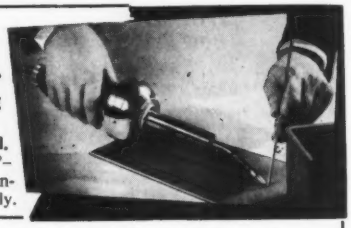

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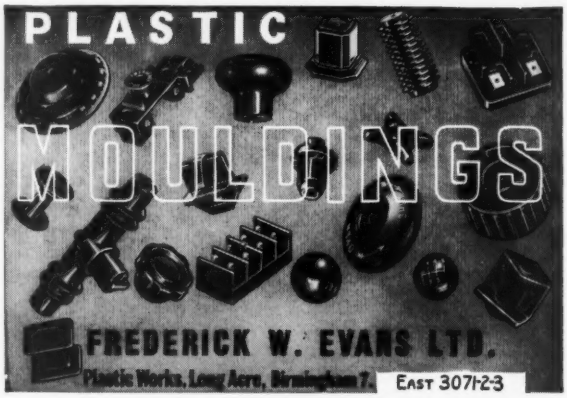

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4½ IN. SHAW EXTRUDER. Recently reconditioned, complete with compounding head, motor drive, etc. In working condition. May be seen in operation at any time. Box P4912, care of "Plastics." 249-24

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INJECTION MOULDING MACHINE urgently required, 1½ oz. Full details to Box P4921, care of "Plastics." 249-40

EXTRUDER AND VACUUM FORMING MACHINES wanted. Send full details Box P4515, care of "Plastics." 250-1122

WANTED. A Blender or Mixer of half ton capacity suitable for blending thermoplastic materials in granular or powder form. Send full details to Box P4910, care of "Plastics." 249-7

INJECTION MOULDING MACHINE wanted in good condition, 1 oz. or near, any make. Box P491, care of "Plastics." 249-13

INJECTION MOULDING MACHINES required. Condition or size not important. Send details Box P497, care of "Plastics." 254-1367

WANTED by moulding company in South Wales, 3 oz., 4 oz. and 8 oz. Injection Moulding Machines. Inspect anywhere, please write Box P4914, care of "Plastics." 250-1369

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YOUR DESIGN
OUR DESIGN
MOULDS TO YOUR SATISFACTION
AND OURS.
PRECONOMY CO. LTD., TOOLMAKERS.
Eastfield side, Sutton-in-Ashfield, Notts.
zzz-146

Moulds (contd.)

COMPRESSION MOULDS FOR SALE. Production of Household Articles, Smokers' Sundries, Fancy Goods, etc. Box P495, care of " Plastics." 254-1366

INJECTION MOULDS.
COMPRESSION MOULDS.
TRANSFER MOULDS.
OUR DESIGN — YOUR DESIGN.
ENGRAVING. HEAT-TREATMENT.
ANY OR ALL SERVICES AVAILABLE.
LEIGH TOOL & GAUGE CO., LTD.
EMPIRE WORKS, CLEVELEYS, LANCS.
Established over 25 years. zzz-172

MOULDS WANTED

MOULDS WANTED. Send details of your surplus or redundant Injection and Compression Moulds. Box P445, care of " Plastics." 249-1026

WHOLESALE DISTRIBUTOR wishes to contact manufacturer of cups and shapes in polythene for the making of ice lollies. H. Rowe Ltd., 5 Nesham St., Newcastle-on-Tyne. 249-x7791

PRODUCTION CAPACITY AVAILABLE

WELL EQUIPPED FIRM have Polythene Moulding Machine available for sub-contract work. Capacity 2–32 oz. Also all kinds of pre-fabricated work. Apply in writing, Polimoulding Ltd., 12 Coldershaw Rd., Ealing, London, W.13. 249-3

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MEDIUM CAPACITY AVAILABLE. Tool and Mould making. Parker Plastics Moulds, Walthamstow, London. Larkswood 2806. 249-1259

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OFFICIAL I.C.I. STOCKISTS " PERSPEX."
SHEET, TUBE, ROD.
STOCKISTS AND FABRICATORS OF " FORMICA."
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Phone, Croydon 8228 (two lines) zzz-133

SILICONE RUBBER MOULDING. Capacity available for prototype and repetition work. ESCO (Rubber) Ltd., 2 Stothard Place, Bishopsgate, London, E.C.2. zzz-164

2-32 OZ. INJECTION MOULDING CAPACITY AVAILABLE. Write to Spa Plastics (Division of Spa Brushes Limited), Chesham, Bucks. Phone: Chesham 81200. zzz-168

EXPERIENCED FABRICATORS IN CORROSION RESISTING PLASTICS. Ducting, tank lining, pipe installations are speciality of A.C. Plastic Industries, 231 Old St., London, E.C.1. CLE 0231. 250-1112

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VACUUM FORMED PLASTICS. Design, printing and production capacity available. The Delta Plastics, Worcester Place, Oxford 57838. 250-1117

MOULDS, INJECTION, COMPRESSION AND TRANSFERS, DIESINKING, DESIGNS. Competitive prices. Russell Engineering Co., Ltd., Russell Rd., Croydon. Thornton Heath 4128. 222-175

GLASSFIBRE reinforced plastic mouldings by Payne & Payne Ltd., 6/10 Priory Mews, London, S.W.8. Own design and pattern making department. Expert laminating team. Phone Macaulay 7687. 252-1304

ALL TYPES INJECTION MOULDINGS, 2 oz., including tool manufacture and design service, under one roof. O.P.H. Ltd., Old Brickworks, Church Road, Harold Wood, Essex. Ingrebourne 41513. 222-179

INJECTION MOULDING, 3 oz. and 4 oz. Martin Golod Ltd., Marbury Gardens, London, N.W.10. WILlesden 3888. 253-1334

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Production Capacity Available (contd.)

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INVITED FOR
INJECTION MOULDINGS.
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TEMPLE WORKS,
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CHINGFORD, E.4.
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INJECTION MOULDING CAPACITY available up to 4 oz. Nylon, polystyrene, polythene and acetate. Modern plant. C.W.C. Equipment Ltd., King's Grove, Maidenhead, Berks. Phone Maidenhead 2275. 249-34

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BRISTOL REPETITION LTD.,

Plastics Division,

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249-37

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Polystyrene.
Cellulose acetate.
Polyethylene.
P.V.C.
Polyvinyl butyral.
Perspex and Diakon.
Send now for details.
Cuex Ltd., 270 Corporation St., Birmingham. Central 5474. 249-30

BLACK POLYTHENE GRANULES. Large supplies always available at 1s. 11d. per lb. Box P472, care of " Plastics." zzz-177

POLYTHENE TAPE. Natural or ivory. Continuous length reels, ¼ in. to 3½ in. wide, 0.010 in. to .060 in. thick. Box P482, care of " Plastics." 250-1333

PLASFILA. New, White, Water Levigated, inert, Filler or Loader, for Rubber and Plastics. Increases strength, reduces costs. Henshaw & Co., 97 Clearmount Rd., Weymouth. 254-1362

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DORMER PLASTICS LTD.
TRADING ESTATE, WEST HARTLEPOOL.
249-28

RAW MATERIAL WANTED

HERBERT CONNOR LTD., Buyers of all Scrap. Top prices paid on any terms for Polythene, Polystyrene, Diakon, Perspex, P.V.C., Acetate, Nylon, in lump, scrap articles, ground and re-ground forms and film offcuts. Please send samples and details to: 120 Beaufort Park, London, N.W.11. 249-32

POLYETHYLENE MOULDING POWDERS, lay-flat tubing and scrap of all kinds wanted against prompt cash payment. Box P398, care of " Plastics." zzz-147

ALL GRADES of nylon scrap required. Box P408, care of " Plastics." 249-29

Raw Materials Wanted (contd.)

THERMOPLASTIC SCRAP. We always buy large and small quantities and pay prompt Cash. Send offers to J. W. Nash & Co. Ltd., 27 Beethoven St., W.10. Ladbroke 4655/6/7. 249-35

POLYTHENE, P.V.C., PERSPEX, POLYSTYRENE, any quantity, urgently required. Multitex Ltd., 12 Penzance Place, Portland Rd., London, W.11. Phone Park 2611. zzz-184

WANTED all types of Polythene Scrap. Send details and samples to: Tyruplex Ltd., 111 High St., N.W.10. Elgar 2684. 249-42

WANTED, Polythene scrap. Write to Box P221, care of " Plastics." zzz-132

SPOT CASH BUYERS of all thermoplastic injection scrap and redundant virgin lots. Regular collections. WG Plastics, 14 Cambridge Park Mews, Twickenham, Middlesex. Popesgrove 1800. 258-1305

BROCKWELL PLASTICS LTD., 50 Hollingbourne Rd., S.E.24, will purchase redundant polyethylene scrap of all kinds. We collect and pay cash on collection. Box P399, care of " Plastics." zzz-148

ACETATE SCRAP wanted. Regular supplies required by London user. Brief details and price to Box P4824, care of " Plastics." 249-1336

LAMINATED INSULATING SHEET wanted in seconds or clearance stock, ⅛ in. and ¼ in. thick, colour immaterial. Box P493, care of " Plastics." 249-11

POLYTHENE SCRAP. Top prices paid on any terms for any form of polythene scrap, i.e. extrusion lumps, scrap articles, film offcuts, ground and re-ground forms. Please send details and samples to: Herbert Connor Ltd., 120 Beaufort Park, London, N.W.11. 249-33

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SITUATIONS VACANT

MILL SHOP SUPERVISOR required for London Factory. Experienced rubber and plastics compounding and with sufficient chemical background for testing, etc., must be able to handle labour and production from Banbury Mixers on shift work. Age 30/50. Apply with full details, qualifications, previous experience and positions held to Box M.4859, Haddon's, Salisbury Sq., E.C.4. 249-1337

PLASTIC MOULD DESIGNER DRAUGHTSMAN required for Thermosetting and Thermoplastic Mould Design. Must be fully conversant with all types of moulds, jigs and fixtures. Able to work with minimum supervision. Edmonton factory, 5-day week. Canteen facilities. Write giving details of qualifications, age and salary expected to: Insulators Ltd., Personnel Department, Leopold Rd., Angel Rd., Edmonton, N. 18. 249-4

REPRESENTATIVE required for Plastic Factory (Injection and Compression Moulding) in North London. Salary and commission. Technical knowledge an advantage but not essential. Write stating age, experience and salary required, to Box P498, care of " Plastics." 249-8

OPPORTUNITY IN CANADA for a young energetic engineer. Small progressive company in Vancouver B.C. in the pipe and custom extrusion business wants an engineer to take over plant operation, die design and new product development. A fine future for man with management abilities. Write stating particulars to Box P496, care of " Plastics." 249-9

TWO CHARGEHAND SETTERS for Bipel Automatic Presses required by a well-known Packaging Company in North London. Applicants must be prepared to work alternate shifts and to work with the minimum of supervision. Full particulars of experience, etc., to Box P494, care of " Plastics." 249-10

A GROUP EDITOR is required by a large technical publishing house for directing the editorial policy and development of a number of technical publications. This is a major executive appointment and calls for an experienced technical journalist with a scientific background who is already in a senior editorial post. Apart from being an authority on the preparation and editing of technical articles and data, he must have up-to-date knowledge of the requirements of engineers and technicians concerned with the engineering, electronic, chemical and plastics industries. For this position a high salary will be paid, but only those possessing the right qualifications will be considered for interview. All applications will be treated as strictly confidential. This vacancy is known to the present editorial staff. Box P492, care of " Plastics." 249-12

WORKS OR PRODUCTION MANAGER required with wide experience on production of articles from natural and synthetic rubbers. This is a senior post carrying a high salary and only men with considerable experience need apply. Box P4919, care of " Plastics." 250-1370

CHEMIST required with specialized knowledge of synthetic rubbers, some knowledge of polyurethanes desirable. The post is a senior one carrying a high salary commensurate with high qualifications. Reply: Managing Director, Tenaplas, Upper Basildon, Berks. 250-1371

Situations Vacant (contd.)

FOREMAN for thermoplastics extrusion/compounding department required in rapidly expanding company. Ability to handle men, machinery and materials well rewarded by salary commensurate with experience and knowledge. Box P4913, care of " Plastics." 249-25

PLASTICS CHEMIST. Young man 25–35 for Melbourne, Australia. Experienced in Plastics Industry with knowledge of Plastics Powders, Granules and their method of working. Salary £A1,800 per annum. Write full details to Box No. AN.54, c/o Streets, 11 Berkeley St., London, W.1. 249-15

CELLGRAVE CO., LTD., require Representative for London and Home Counties. Experience in Plastics preferred. Good Commercial experience and Education. Applications to Alpha House, Choumert Rd., London, S.E.15. 249-18

PLASTIC SHEET MANIPULATION. Man with experience of Vacuum Forming or similar techniques required to supervise shift work in a new department using latest type Vacuum Forming Machines and ancillary equipment. Apply Personnel Office, Halex, Larkshall Rd., E.4. 249-22

PLASTICS TECHNOLOGIST

THE DISTILLERS CO., LTD.

The Company has a vacancy for a specialist representative who will be based in London to cover the Plastics Industry on a national basis, to provide technical service to their customers in collaboration with the sales staff. Candidates should be Plastics Technologists of at least ten years' experience preferably between 30 and 40 years of age. Salary according to qualifications and experience. Non-contributory pension scheme.

Write:

STAFF MANAGER,

THE DISTILLERS CO., LTD.,

21 ST. JAMES'S SQUARE,

LONDON, S.W.1.

Quote Ref. 32/58 PL. 249-17

HYDRAULICS MAINTENANCE FITTER required for large Injection Moulding Plant. Extensive experience essential. Contributory pension scheme. Apply Personnel Office, Halex, Larkshall Rd., E.4. 249-21

Situations Vacant (contd.)

THE METAL BOX CO., LTD.,

PLASTICS GROUP,

is expanding in the manufacture of thermoplastic mouldings, plastics bottles and flexible packaging, including polythene film.

Vacancies have arisen on a growing Sales Staff.

SENIOR AND JUNIOR SALESMEN

are required with experience in selling plastics for packaging. Appointments will be based upon London, Midlands, North of England and Scotland.

Applications, treated in strict confidence, should be addressed to:

HEAD OF STAFF DIVISION,
THE METAL BOX CO., LTD.,
37 BAKER STREET, W.1,
quoting reference PLR/3. 249-38

WE REQUIRE an experienced and energetic man to take charge of our Injection Moulding Shop. Must be capable of obtaining highest possible output from both man and machine. Permanent and well paid position to the right man. Apply with full details of experience, age and salary required. Seaforth, Watchett Works, Oakhurst Rd., Southend-on-Sea. 250-1363

CALENDER SHOP FOREMAN REQUIRED for Proofing Department of Rubber Factory in Johannesburg, South Africa. Actual experience of operating four-bowl vertical calender essential. Knowledge of calender coating p.v.c. on to fabrics desirable and of p.v.c., spreading an advantage.

Pension and Medical Aid Funds in operation as well as State Unemployment Benefit Fund.

(The successful applicant will enjoy a high standard of living in one of the finest climates in the world where taxation is considerably lower than in the U.K.).

Reply stating qualifications, age, marital status and salary required. Box P4916, care of " Plastics." 249-27

Situations Vacant (contd.)

EXPERIENCED PLASTICS CRAFTSMAN, Fabricating and Sheet Moulding, required. Intricate and interesting work. Only good men need apply. Emphasis on first-class craftsmanship. Send particulars and salary required. London Area. Box P4911, care of " Plastics." 249-x7536

COMPANY developing new laminated plastics product with ample finance and productive capacity seek the services of a **CHEMIST** on a consultancy basis.

Applications are invited from those qualified in the fields of laminates incorporating urea formaldehyde and melamine resins.

Details should be forwarded to Box P4920, care of " Plastics." 249-39

GLASSFIBRE. A position has become vacant in the West Midland area for an experienced technician to take charge of a Department covering production and development. Applicants must state experience, age and salary required. Box P4917, care of " Plastics." 249-26

SITUATIONS WANTED

EXPERIENCED REPRESENTATIVE, young and well educated, covering East Anglia, seeks change. Calling on Architects, Local Authorities, Industry, etc. Tebbutt, 273 Coldhams Lane, Cambridge. 249-x7841

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FACTORY TIME RECORDERS. Service rental. Phone, Hop 2239. Time Recorder Supply and Maintenance Co., Ltd., 157–159 Borough High St., S.E.1. 257-1206

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DON'T DRAIN YOUR PROFITS. Save approximately 98% of your water. Instal a " SILENT FALLS " recirculating water cooler. Constant pressure at controlled temperatures. Details from makers. Mechanical Kold Ltd., 411 West Green Rd., Tottenham, N.15. 222-182

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EDITORIAL AND BUSINESS NOTICES

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